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DEPARTMENT OF FISH AND GAME

Jerry M. Conley, Director

FEDERAL AID IN FISH RESTORATION

Job Performance Report

Project F-71-R-11

REGIONAL FISHERY MANAGEMENT INVESTIGATIONS

Job No. 3(MC)-a.	McCall Subregion Mountain Lakes Investigations
Job No. 3(MC)-b1.	McCall Subregion Lowland Lake and Reservoir Investigations Job
Job No. 3(MC)-b2.	McCall Subregion Lowland Lake and Reservoir Investigations
Job No. 3(MC)-c.	McCall Subregion River and Stream Investigations
Job No. 3(MC)-d.	McCall Subregion Technical Guidance
Job No. 3(MC)-e.	McCall Subregion Salmon and Steelhead Investigations

by

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State of: Idaho

Project No.: F-71-R-11

Job No.: 3(MC)-a

Name: REGIONAL FISHERY MANAGEMENT INVESTIGATIONS

Title: McCall Subregion Mountain Lakes Investigations

Period Covered: July 1, 1986 to June 30, 1987

ABSTRACT

The Payette National Forest and the Idaho Department of Fish and Game solicited information from backcountry visitors in high use areas near McCall. Data was reported on 14 lakes or lake chains. Catch rates, fish species and size, as reported by anglers, were evaluated relative to stocking records and relative intensity of fishing effort. Lakes close to McCall and close to a trailhead were more heavily fished than more remote lakes. Catch rates were lowest and number of encounters with other users higher in easily accessed lakes.

Additionally, the Idaho Department of Fish and Game sent fishing survey forms to the ten McCall Subregion outfitters who guide anglers to mountain lakes. Three of the ten responded with catch data. Catch rates, size of fish and percent released alive were compared with stocking records for each lake. Lakes southwest of the confluence of the Salmon River and its Middle Fork had best catches and catch rates and were associated with high release rates. Lakes near Big Creek had the poorest fishing and were associated with low release rates. Differences may also be affected by lake productivity, altitude and year of stocking.

Where brook trout were established they dominated the catch and greatly reduced survival and growth of other trout species. Management options are recommended to satisfy demand for both yield and quality fishing opportunities.

No effects of the introduced fall chinook salmon were observed on stunted brook trout populations in Grassy Mountain Lakes #1 and #2. Fall chinook introduced in 1984 were not observed in the 1986 samples. Condition factor of brook trout sampled was slightly lower in 1986 than in 1985.

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OBJECTIVES

1. To document the extent of recreational use in popular mountain lakes within a 50 km radius of McCall.

2. To determine whether management changes are necessary where intensive use occurs.

3. To evaluate the effects of outfitters on fisheries in remote mountain lakes.

4. To detect changes in the brook trout (Salvelinus fontinalis) population following introductions (1984 and 1986) of fall chinook (Oncorhynchus tshawytscha) into high mountain lakes.

5. To evaluate stocking rates and planting techniques for future use of fall chinook salmon to influence brook trout populations in similar lakes.

RECOMMENDATIONS

1. Provide for diversity of angling opportunity regarding catch rate and size and species of fish by adjusting frequency, number and species planted.

2. Stock "close in" lakes annually and reduce numbers planted per year to accomplish a 50% increase in number of fish planted over that of the traditional three-year rotation period.

3. Continue to solicit input from local outfitters regarding fishing quality and success in central Idaho alpine lakes to see what changes occur in catch rate and fish size as affected by fishing effort and stocking regime.

4. Provide comments to the Idaho Outfitters and Guides Board on applications for license to fish mountain lakes. These comments should include recommendations regulating number of clients, number of trips and possibly limitations on weekend and holiday use to reduce conflicts between private and commercial interest while maintaining high-quality experiences.

5. Continue monitoring brook trout and fall chinook populations in Grassy Mountain Lakes #1 and #2.

6. Discontinue stocking Age 0+ chinook salmon as predators on stunted brook trout.

7. Expand the evaluation of predatory manipulation of stunted brook trout to include subcatchable-size brown trout.

TECHNIQUES USED

Trailhead Registration and Postal Survey

The Payette National Forest and the Idaho Department of Fish and Game solicited information from backcountry visitors in high use areas near McCall. The McCall district of the Payette National Forest (PNF) established registration boxes at the "20 Mile Lakes" and Loon Lake trailheads to the north of McCall and at Boulder Lake to the east. The Krassel District PNF established registration boxes along Lick Creek Road and at the Buckhorn Lakes trailhead. The PNF sought information relative to general user satisfaction and type of uses pursued. The IDFG then sent postal questionnaires to those registrants who indicated that fishing was at least part of their backcountry experience. The IDFG and PNF shared the information from the postal questionnaire with the IDFG using data pertaining directly to the fishery.

Fishery information obtained included catch rate, species composition, fish size, and relative use in terms of number of trips reported and number of other users encountered. Data was reported on 14 lakes or lake chains. Strains of trout stocked in mountain lakes and discussed in this report include R-1 (unspecified stock of rainbow trout), R-4 (Mt. Lassen rainbow trout), C-1 (unspecified stock of cutthroat trout). C-2 (westslope cutthroat trout) and C-3 (Henrys Lake cutthroat trout).

Outfitters and Guides Survey

The McCall Subregion sent fishing survey forms (Fig. 1) and a letter requesting information on fishing to the ten area outfitters who guide anglers to mountain lakes. Four of the ten responded, one of the four said he had not guided anglers in 1986.

Evaluation of Fall Chinook Salmon on Stunted Brook Trout in Mountain Lakes

Grassy Mountain Lakes #1 and #2 (T21N,R23,SIO) lie in the Salmon River Drainage about midway between McCall, Idaho, and Riggins, Idaho (Fig. 2). These lakes drain into Hard Creek and are accessed by traveling the Brundage Mountain/Hazard Lakes road to the Vance Creek trailhead and walking about two miles to the southwest on a well-maintained trail. Each lake is 10.3 hectares with dense populations of small brook trout.

Volunteers from the Payette National Forest and the University of Idaho assisted Idaho Department of Fish and Game personnel in sampling Grassy Mountain Lakes #1 and #2 in August of 1986. Hook-and-line sampling gear was used to obtain fish population data. Total lengths of

Outfitter and Guides Mountain Lake Creel Census Report
For Idaho Dept. Fish & Game Survey

Date_____ Name_____
Lake_____ Drainage_____
Total hours fished_____

Enter the number of fish caught by length and species below

Species	< 8"	8"	9"	10"	11"	12"	13"	14"	15"	16"	17"	18"	>18"
Cutthroat													
Rainbow													
Brook													
Bull													
Other_____													

What part, if any, of the above catch was released alive?_____

Total fishing hours is the sum of hours fished by all person in your party. Please fill out one of these cards at the end of each day for each lake fished.

To use the catch table write the number of fish separated by inches (to the nearest inch) in each box below the corresponding length and to the right of the corresponding species.

You may wish to use the ruler below to measure your fish.

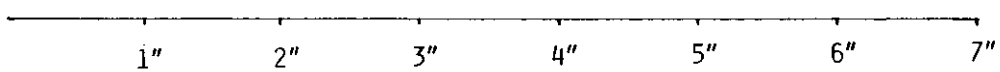

Figure 1. Mountain lake survey form sent to outfitters and guides in the McCall Subregion.

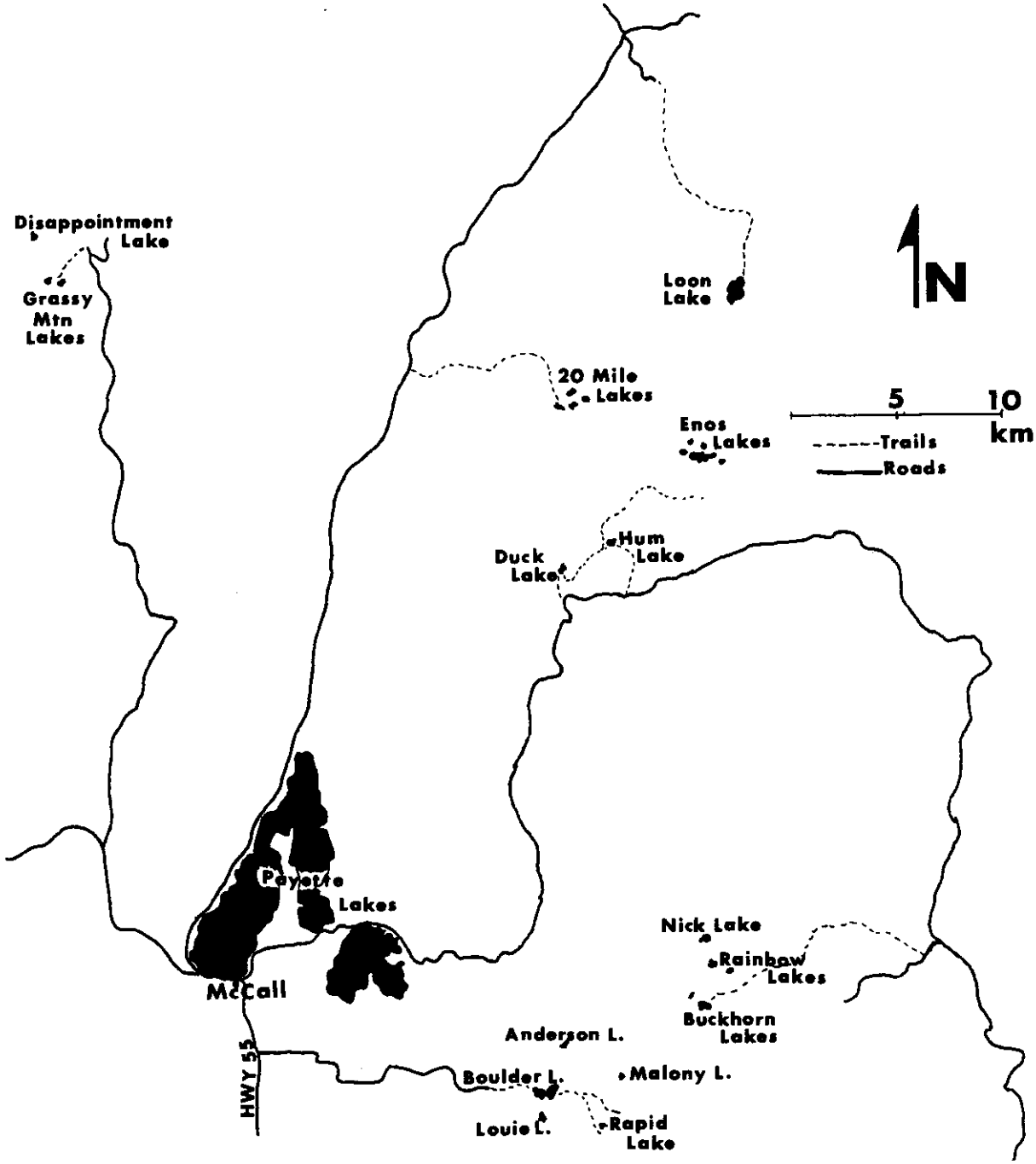

Figure 2. Mountain lakes near McCall, Idaho, which are mentioned in the evaluation of fall chinook salmon in brook trout lakes and in the trailhead registration studies.

fall chinook salmon and brook trout were measured in millimeters (mm), and weights of brook trout were weighed in grams (g). A condition factor (K) was calculated for brook trout using the Fulton-type formula:

$$K - (W/L^3)(X)$$

where W - weight in grams
L = length in millimeters
X = arbitrary scaling constant (100,000)

On July 11, 1986, age 1+ fall chinook, reared at the Mullan State Fish Hatchery and averaging 9.9 fish per kilogram, were loaded into a "monsoon bucket" and transported to each lake by helicopter. Table 1 lists stocking rates for both 1984 and 1986.

Table 1. Stocking rates and sizes of fall chinook salmon in Grassy Mountain Lakes /1 and #2, 1984 and 1986.

	Grassy Mountain Lake #1		Grassy Mountain Lake #2	
	1984	1986	1984	1986
No. planted	500	126	300	126
Fish/kg	41.9	9.9	41.9	9.9
Age	0+	1+	0+	1+
Fish/ha	49.4	12.2	29.6	12.2

FINDINGS

Trailhead **Registration** and Postal Survey

Looking at lakes from north to south (see map, Fig. 2), Loon Lake was stocked eight times with rainbow trout from 1972-1985; most recently with 1, 600 RIs in 1982 and 1,500 R4s in 1985. Ten trips were registered: one in June, eight in July and one in August. Average-size fish reported by anglers included 10-inch cutthroat trout, 7-inch rainbow trout and 6-inch brook trout. Combined catch rate was 1.7, 1.6, and 0.9 fish per hour for the months of June, July and August. An average of 4 hikers, 2 bikers and 3 horsemen were seen on each reported trip into Loon Lake. Anglers released 60% of their catch (Tables 2 and 3).

The Twenty-Mile lake chain includes North, East, South and Long lakes. North Twenty-Mile Lake was stocked with rainbow trout in 1982 (1,000 RIs) and 1985 (1,000 R4s) and prior to that with cutthroat and rainbow trout (CI and R1) in 1972. Four fishing trips were reported in August and one in September. Both rainbow and cutthroat trout 11 to 13 inches long were reported, and catch rates were 0.9 to 1.3 fish per hour. Forty-five percent of the catch was released. An average of 7 hikers, 1 biker and 7 horsemen were seen by each reporter.

TabLe 2. Lake surface area, attitude, recent stocking history, species and length caught and fish growth per year at 14 west-central Idaho mountain Lakes.

			Recent stocking numbers, species and year					Average length caught				
Lake	Hectares	Meters	1981	1982	1983	1984	1985	CT	RB	BK	GR	Growth/ year
Loon	40	1174	—	1600 R1	—	—	1500 R4	10"	7"	6"	—	—
N. 20 Mile	6	2399	—	1000 R1	—	—	1000 R4	12"	13"	—	—	3"
S. 20 Mile	4	2399	—	—	—	1000 C2	—	12"	13"	—	—	—
Enos	19	2353	—	500 C1			500 C2					
				1000 R1	—	—	1000 R4	14"	—	—	—	3.5
Hum	7	2057	700 RC	—	—	—	—	14"	12 & 8"	—	—	2.5
Duck	6	2088	None	—	—	—	—	—	9-10"	11"	—	—
Buckhorn	6-12	2121	—	—	—	1000 C2	500 R4	10"	—	—	—	5"
Rainbow	5-6	2219	—	—	—	1000 R1	—	—	11"	—	—	5.5"
Nick	10	2219	—	—	—	1500 C2	—	—	—	8"	—	—
Boulder	37	2124	—	1000 R1	—	—	1000 R4	10"	10"	5"	—	2.5"
Anderson	3	2228	None	—	—	—	—	—	8"	7"	—	—
Louie	9	2134	—	—	500 R1	1000 C2	—	15"	—	—	—	—
Maloney	3	2198	—	1500 GR	—	—	—	—	—	—	7&15"	—
Rapid	5	2201	—	—	—	1000 C2	—	—	—	8"	—	4"

Table 3. Fourteen west-central Idaho lakes, their identifying state cataloging numbers, the number of fishing trips reported at trailhead registration boxes, the number of other users encountered per trip, the percent of fish released and the catch rate in fish per hour.

Lake	Catalog number	Registerd trips	Encounters per trip			% of fish released	Catch rate (fish/hr)
			Hikers	Bikers	Horse		
Loon	07-325	10	4	2	3	60	1.5
N. 20 Mile	09-395	5	7	1	7	45	1.0
S. 20 Mile	09-397	9	0	0	<1	80	1.5
Enos	07-316	5	<1	0	0	75	3.0
Hum	07-309	13	2.5	0	<1	20	0.5
Duck	07-310	10	2	<1	0	70	0.9
Buckhorn	07-484	2	0	0	0	50	1.1
Rainbow	07-384	1	0	0	0	80	6.0
Nick	07-476	1	0	0	0	0	10.0
Boulder	09-320	36	12	<1	<1	70	0.5
Anderson	09-336	4	2.5	<1	2	70	1.5
Louie	09-318	2	3	2	0	0	0.5
Maloney	09-338	2	35	0	0	40	0.3
Rapid	09-312	10	11	3	6	60	2.5

Five trips to South Twenty-Mile Lake were reported in August and two in September. Both cutthroat and rainbow trout were reported, averaging 13 inches long. In 1984, 1,000 C2s were stocked. Between then and 1972, four plants were made of both rainbow and cutthroat trout. Catch rate was 2.1 fish per hour in August and 1.3 fish per hour in September. Approximately 802 of the catch was released. There were no encounters reported with hikers or bikers and less than one encounter with horsemen per trip.

There were seven reported trips to lakes referred to only as Twenty-Mile Lake. Catch rates were 0.5 to 0.7 fish per hour for cutthroat trout, averaging 10-15 inches long. Sixty to seventy percent of the catch was released. An average of five hikers, less than one biker and three horsemen were seen per trip. Each of the Twenty-Mile Lakes was stocked in 1982 and 1985 with 1,000 rainbow trout.

There are five Enos lakes, four of which are small and one quite large (Enos #2). Six fishing trips were registered for the Enos lakes from June through September. Catch rates ranged from 0.0 to 6.7 fish per hour. Only cutthroat trout were reported in the catch, and they averaged 14 inches long. About 75Z of the fish captured were released. Less than one hiker was encountered per trip, and no bikers or horsemen were seen. All Enos lakes were planted in 1982, and in 1985 all but Enos #4 were planted. Enos #2 and #5 received C-2s in 1985; Enos #1 and #3 received R-4s. Enos #2 and #5 are planted with 1,000 fish and Enos #1, #3 and #4 are planted with 500 fish.

Hum Lake was stocked with 2,500 cutthroat trout in 1972 and 700 rainbow-cutthroat hybrids in 1981. Thirteen fishing trips were registered for Hum Lake in 1986. Species reported were cutthroat and rainbow trout averaging 12 to 16 inches in length. Catch rates ranged from 0.2 fish per hour in June to 1.0 fish per hour in September. Two to three hikers and no bikers were encountered per trip. Horsemen were rarely encountered during these trips. Seventeen percent of the catch was released.

Duck Lake has not been stocked during the past 12 years. Reported catch is mostly brook trout and a smaller number of rainbow trout. Average size of these species is 11 inches and 10 inches, respectively. Catch rate is 0.8 to 1. 0 fish per hour. An average of two hikers, no horsemen and only an occasional biker were encountered per trip (0.1/trip).

There are several other lakes which are accessed from the Lick Creek Road, but few fishing trips were registered for them.

Buckhorn, Rainbow, and Nick lakes are accessed from the Buckhorn Creek road off the South Fork Salmon River. These areas received few registered trips in comparison to those nearer McCall. There are six Buckhorn, two Rainbow and two Nick lakes. The Buckhorn lakes were stocked with rainbow and cutthroat trout until 1982, when a rainbow-cutthroat hybrid was stocked. From 1982 through 1985, only two Buckhorn lakes were stocked; one with rainbow trout in 1982 and 1985 and the other with cutthroat trout in 1984. Two trips were registered to

Buckhorn Lake in 1986. Cutthroat trout averaging 10 inches long were caught at a rate of 1.1 fish per hour. About 50% of the catch was released. No other users were encountered.

Rainbow Lake(s) has been planted five times with rainbow trout since 1978, most recently in 1984 with 1,000 R1. One trip was registered to Rainbow Lake in July. Rainbow trout, averaging 11 inches in length were caught at a rate of 6 fish per hour. Eighty-three percent of the catch was released; no other users were encountered.

Nick Lake(s) has been stocked seven times since 1972, always with cutthroat trout except that hybrid rainbow-cutthroat trout were stocked in 1981. Most recently, 1,500 C-2s were stocked in 1984. Only one trip was registered in 1986. Brook trout averaging 8 inches long were caught at a rate of 10 fish per hour. All fish were kept by the anglers. No other users were encountered.

The Boulder Creek trailhead is about 10 miles from McCall and accesses Boulder, Louie, Rapid, Maloney and Anderson lakes. Boulder Lake is by far the largest in that group and the closest to the trailhead. It has been stocked seven times since 1972, always with rainbow trout except in 1975 when it was stocked with cutthroat trout (C-is). The most recent plants were 1,000 rainbow trout in both 1982 and 1985. Thirty-six fishing trips were registered to Boulder Lake in 1986. Rainbow, cutthroat and brook trout were reported in the catch. The former two species averaged 11 inches and the latter averaged 5 inches in length. Catch rates were 0.8 to 1.0 fish per hour in June and July and decreased to 0.2 to 0.3 fish per hour in August and September. About 70% of the catch was released. An average of 12 hikers, 0.3 bikers and 0.6 horsemen were encountered per registered fishing trip.

Anderson Lake was not stocked during the time interval 1972-1985. Both rainbow and brook trout were reported in the catch, the former averaging 8 inches and the latter 7 inches long. Catch rate was 0.8 fish per hour in August and increased to 2.3 fish per hour in September. Seventy percent of the catch was released. Anglers reported encountering an average of 2.5 hikers, 0.5 bikers and 2 horsemen per trip.

Louie Lake has been planted seven times since 1972: five times with cutthroat and two times with rainbow trout. Most recently, Louie Lake received 500 rainbow trout in 1983 and 1,000 cutthroat trout (C-2s) in 1984. There were two registered fishing trips to Louie Lake in July 1986. Anglers reported catching cutthroat trout averaging 15 inches in length and reported a catch rate of 0.5 fish per hour; none were released. An average of three hikers and two bikers were encountered per trip.

Maloney Lake has been planted twice since 1982, both times with grayling. There were 3,400 stocked in 1973 and 1,150 in 1982. Two registered trips were reported in July 1986. The average size grayling was 7 inches long, and catch rate was 0.3 fish per hour. Two trips to Maloney Lake were made by Idaho Department of Fish and Game personnel in August and September 1986. Grayling of 14 to 16 inches were captured,

and catch rates were 0.5 fish per hour. Forty percent of the reported catch was released. An average of 35 hikers per trip were encountered; no doubt most of them were in the lower part of the trail between the trailhead and Boulder Lake.

Rapid Lake has been stocked four times since 1972: once each with rainbow trout and rainbow cutthroat hybrids and twice with cutthroat trout. The most recent release was of 1,000 cutthroat trout (C-2s) in 1984. Ten fishing trips were registered to Rapid Lake between June and September of 1986. The only species reported was brook trout, which averaged 8 to 9 inches long, and they were caught at a rate of 2.5 fish per hour.

Outfitters and Guides Survey

Outfitter Dave Giles supplied information on six lakes and one stream in an area west of the Middle Fork Salmon River and south of the Salmon River. Most of the lakes are at the head of streams flowing into the main Salmon River (Table 4). Giles has very good fishing in his waters, with several of the lakes producing trout which average 13 to 15 inches long. Basin Lake, for example, produced adult cutthroat trout 13 to 18 inches long and juveniles up to 8 inches long in 1986 from trout fry stocked in 1982 and 1985. Giles' fishing parties released 50% of the adults and 100% of the juveniles, and they generally released at least 502 of their catch in all lakes. Releasing trout may contribute to the large average size of fish caught.

Giles' catch rate was very high. Average trout size was small for brook trout in Cottonwood Creek, and 90% of Giles' catch was released alive. This appears to be a case of overpopulation, and Giles was encouraged to harvest rather than release brook trout from Cottonwood Creek. This should lead to better growth of the trout that remain.

Butts Lake was stocked with rainbow trout in 1983, and Giles reported a catch of cutthroat 8 to 13 inches in 1986.

Black Lake was stocked with rainbow trout in 1981 and 1984 and produced rainbow trout from 12 to 17 inches long.

Swamp Angel Lake is one of the upper Butts Creek lakes and is not listed as such on the planting schedule; therefore, there is no planting record for this lake. Several age classes of both cutthroat and rainbow trout were reported to be in the lake with fish from 7 to 16 inches in the catch.

Upper Basin Lake was last stocked with rainbow trout in 1980. Reported catch is a mix of cutthroat and rainbow trout from 11 to 14 inches long.

Cottonwood Lake (Kitchen Creek #6) was last stocked with rainbow-cutthroat trout hybrids in 1981. At least two *year* classes were represented in 1986, with size of cutthroat trout ranging from 8 to 14 inches.

Table 4. Summary of fishery statistics on six mountain lakes and one stream in the southwest corner of the confluence area of the main Salmon River and its Middle Fork in 1986, provided by outfitter Dave Giles.

Date	Hours fished	Species	Number Caught	Number Released	Average size	Size range	Fish/ hour	% released
Basin Lake (Cottonwood Creek drainage)								
7/08	95	Cutthroat	44	32	13"	8"-16"	0.5	73%
7/10	15	Cutthroat	9	0	15 1/2"	14"-18"	0.6	0%
8/02	5	Cutthroat	5	4	14"	13"-16"	1.0	80%
8/22	2.5	Cutthroat	5	5	<8"	<8"	2.0	100%
Overall averages: Fish/hour = 0.54, % released = 65%								
Comments: Need more fish in this lake.								
Butts Lake (Butts Creek drainage)								
7/09	40	Cutthroat	137	117	10 1/2"	8"-13"	3.4	85%
7/21	7	Cutthroat	7	7	8 1/2"	8"- 9"	1.0	100%
Overall averages: Fish/hour = 3.1, % released = 86%								
Comments: Many lilly pads and swampy on 7/21.								
Black Lake (Perk Creek drainage)								
8/18	3	Rainbow	6	6	12"	10"-14"	2.0	100%
8/19	11	Rainbow	36	29	14"	12"-17"	3.3	81%
8/20	10	Rainbow	16	16	13 1/2"	12"-15"	1.6	100%
Overall averages: Fish/hour = 2.4, % released = 88%								
Comments: None								
Swamp Angel Lake (Butts Creek drainage)								
7/09	50	Cutthroat?	22	10	15"	14"-16"	0.4	45%
7/20	10	Rainbow?	17	9	10"	9"-12"	1.7	53%
7/31	4	Cutthroat	5	2	10"	7"-14"	1.3	40%
Overall averages: Fish/hour = 0.7, % released = 48%								
Comments: None								

Table 4. Continued.

Date	Hours fished	Species	Number Caught	Number Released	Average size	Size range	Fish/ hour	% released
Upper Basin Lake (Cottonwood Creek drainage)								
7/10	16	Cutthroat	32	20	12"	11"-13"	2.0	63%
8/02	9	Rainbow	3	0				
		Cutthroat	3	0	13 1/2"	13"-14"	0.7	0%
Overall averages: Fish/hour = 1.5, % released = 53%								
Comments: None								
Cottonwood Lake (Kitchen Creek drainage)								
8/01	16	Cutthroat	19	12	11"	8"-14"	1.2	63%
Comments: None								
Cottonwood Creek								
8/16	8	Brook trout	100	90	<8"	<8"	12.5	90%

Mackay Bar Outfitters provided information on three lakes in the Chamberlain Creek drainage (Table 5). Flossie Lake was last planted with rainbow trout in 1981 and 1984. The catch was rainbow trout from 7 to 9 inches long, apparently representing only the 1984 stocking.

Sheepeater Lake was stocked with rainbow-cutthroat hybrids in 1981 and cutthroat trout in 1984. Catch was of cutthroat trout from 10 to 14 inches long. The larger fish may be from the 1981 release or from natural reproduction.

Cutthroat Lake is not listed on the stocking schedule. The 9- to 12-inch cutthroat may be from natural reproduction, or the lake may be stocked under a different name.

Outfitter Ronald Vaughn supplied information on four lakes in the Big Creek (Middle Fork Salmon River) drainage (Table 6). The catch from Vaughn's lakes consists of generally small trout. In contrast to the two previously discussed outfitters, a very small percent of Vaughn's catch is released.

Roosevelt Lake is a natural lake on the main stem of Monumental Creek. In order to reduce competition with juvenile steelhead trout and chinook salmon in the area, fish are not stocked in Roosevelt Lake. Fish reported caught in Roosevelt Lake were small cutthroat and brook trout. Cutthroat are indigenous, and brook trout were possibly introduced in earlier years and formed a self-sustaining population, or the brook trout may be an incorrectly identified bull trout, an indigenous species.

Logan Lake is not listed on the stocking schedule after 1972. It appears, however, that it was stocked in 1984 or 1985 with rainbow trout and may be called another name, or the trout population may be self-sustaining. The catch in Logan Lake was rainbow trout 8 to 10 inches long.

Lick Lake was stocked in 1975 and 1982 with cutthroat. Catch is reported to be a mix of cutthroat and rainbow trout, with more than one year class represented, i.e., lengths range from 8 to 12 inches.

Bear Lake (Monumental Creek drainage) had high catch rates (4 fish per hour) for small rainbow trout. There is no stocking record for this lake back to 1972, and it is likely that the lake has a dense self-sustaining population.

Evaluation of Fall Chinook on Stunted Brook Trout in Mountain Lakes

Grassy Mountain Lakes #l and #2 were sampled on August 2 and 3, 1986. Fishing was conducted from the shoreline in both lakes using artificial flies, bait and lures. A raft was also used in Grassy Mountain Lake #2. Many small fish were observed rising to the surface near the center of both lakes, and brook trout could be seen from the

Table 5. Summary of fishery statistics on three mountain lakes in the Chamberlain Creek drainage of the Salmon River in 1986, provided by Mackay Bar Outfitters.

Date	Hours fished	Species	Number Caught	Number Released	Average size	Size range	Fish/ hour	% released
Flossie Lake [Chamberlain Creek drainage]								
7/05	2	Rainbow	6	6	8"	7"- 8"	3.0	100%
7/08	3	Rainbow	22	15	7"	7"- 9"	7.3	68%
7/12	6	Rainbow	14	10	7"	7"- 9"	2.3	71%
8/12	3	Rainbow	2	2	7"	7"	0.6	100%
8/27	3	Rainbow	3	3	8"	7" -9"	1.0	100%
Overall averages: Fish/hour = 2.8, % released = 77%								
Comments: None								
Sheep Eater [Chamberlain Creek drainage]								
8/01	20	Cutthroat	5	0	12"	10"-14"	0.25	0%
8/07	5	Cutthroat	3	2	11"	10"-13"	0.6	67%
8/25	5	Cutthroat	1	1	12"	12"	0.2	100%
Overall averages: Fish/hour = 0.3, % released = 33%								
Cutthroat Lake [Chamberlain Creek drainage]								
8/08	10	Cutthroat	2	1	10 1/2"	9"-12"	0.2	50%

Table 6. Summary of fishery statistics on four mountain Lakes in the Big Creek drainage of the Middle Fork of the Salmon River in 1986, provided by outfitter Ronald Vaughn.

Date	Hours fished	Species	Number Caught	Number Released	Average size	Size range	Fish/ hour
Roosevelt Lake (Monumental Creek Drainage)							
8/23	3	Cutthroat	1	0	8"	8"	—
		Brook	5	0	<8"	<8"	2.0
Logan Lake (Logan Creek drainage, tributary to Big Creek							
7/02	5	Rainbow	5	0	<8"	<8"-9"	1.0
8/23	10	Rainbow	12	0	8"	<8"-10"	1.2
Lick Lake (Big Creek drainage)							
7/02	6	Cutthroat	5	0	10"	9"-11"	0.8
7/03	5	Cutthroat	3	0	11"	10"-12"	—
		Rainbow	5	0	10"	10"	1.6
7/04	2	Rainbow	11	11	<8"	<8"-10"	5.5
8/18	4	—	0	—	—	—	—
Bear Lake (Monumental Creek drainage)							
8/08	3	Rainbow	12	0	8"	8"-10"	4.0
8/09	4	Rainbow	15	0	8"	8"-10"	3.8

No fish were released

bank. Fall chinook from the 1984 plant were not observed in the creel in 1986. It is believed that these fish did not survive the second year.

In Grassy Mountain Lake #1, a total of 23 brook trout and 4 chinook from the 1986 plant were caught during 14.5 hours of fishing. Recorded lengths of brook trout ranged from 152 mm to 267 mm (mean length = 215 mm), while weights ranged from 40 g to 133 g (mean weight - 85 g) (Table 7). The average condition factor was 0.86. Fall chinook ranged in length from 203 mm to 235 mm (mean length = 219 mm). Mean length and weight at planting was 230 mm and 101 g, respectively.

In Grassy Mountain Lake #2, 22 brook trout and 2 fall chinook from the 1986 planting were caught during 23.5 hours of fishing. The brook trout ranged in length from 114 to 225 mm (mean length = 200 mm) and in weight from 35 g to 120 g (mean weight = 71 g) (Table 7). The average condition factor was 0.89. Fall chinook in Grassy Mountain #2 were 191 mm and 229 mm in length (mean length = 210).

Table 7. Mean length (mm), mean weight (g), and average condition factor (K) for brook trout sampled in Grassy Mountain Lakes #1 and #2 from 1984 to 1986.

	Sample size (n)	Mean length (mm)	Sample size (n)	Mean weight (g)	Condition factor (K)
Grassy Mtn #1					
1984	76	189	39	93	1.38
1985	28	209	28	84	0.93
1986	23	215	23	85	0.86
Grassy Mtn #2					
1984	68	190	50	77	1.11
1985	36	205	36	80	0.93
1986	22	200	22	71	0.89

DISCUSSION

Trailhead Registration and Postal Survey

Lake size ranged from 3.2 hectares to 40.5 hectares, and elevations ranged from 1,774 m to 2,400 m. Ice cover generally begins in October and lasts into June. Growth of stocked rainbow and cutthroat trout appears, from angler reports, to be about 5 inches the first year then 2 to 3 inches per year in the following years.

Fish averaging 12 inches or longer were reported from the Twenty-Mile lakes, Enos and Hum lakes and from Louie Lake. Boulder Lake, which is relatively larger and appears to be the most heavily fished lake in the McCall area, produced cutthroat and rainbow trout averaging 10 inches in length. Neither Duck nor Anderson Lake have been stocked for at least 12 years. Both lakes, however, have self-sustaining brook trout populations, and Anderson Lake is also reported to have a rainbow trout population. Although Rapid Lake was stocked with cutthroat trout, brook trout were the only fish reported in the catch. Except in Duck Lake, reported to be a shallow and productive lake, brook trout are generally smaller than the rainbow and cutthroat trout in McCall area mountain lakes.

Grayling in Maloney Lake are either self-sustaining or very long lived. They were stocked in 1973 and again in 1982, and the two sizes (7 inches and 14 to 16 inches) seen in the lake would indicate that at least two age classes occurred in 1986. Maximum age of grayling is considered to be 11 or 12 years (Scott and Grossman 1979); thus, it is unlikely that fish from the 1973 plant would have been caught in 1986.

Registered trips were greatest at the Boulder Creek trailhead and least at the Buckhorn Creek trailhead. Frequency of encountering other users has a similar trend with travelers to Boulder and Maloney lakes encountering more than 10 people per trip and those traveling to the Buckhorn lakes generally encountering no one. Looking at these same lake groups, an inverse relationship appears to exist between fishing intensity (as indicated both by number of registered trips and number of other users encountered) and catch rate. That is, those willing to travel to less used areas have better fishing success.

On the average, 50Z of the angler's catch was released alive. This was rarely due to creel limit restrictions, but rather to a voluntary choice of whether to harvest or release the fish. This trend toward releasing fish no doubt has a positive effect on catch rate and size of fish where cutthroat and rainbow trout are involved, especially in heavily fished lakes. In contrast, it may have a negative effect where self-sustaining, stunted populations of brook trout occur, such as in Loon, Nick, Boulder, Anderson and Rapid lakes.

Except for lakes which are known to have self-sustaining fish populations or to be incapable of supporting fish through the winter, mountain lakes in the McCall Subregion are stocked every third year, with one-third of the lakes being stocked each year. McCall Subregion mountain lakes are generally stocked from fixed-wing aircraft, with 500 to 700 fish going to " small" lakes and 1,000 to 1,500 going to "large" lakes. Size of fish planted is near "1,000 to the pound."

It appears, from the unequal distribution of fishing effort at McCall area mountain lakes, that more variation in management is warranted. Boulder Lake should be stocked more frequently to meet the harvest demand. Lakes such as those in the Buckhorn chain could perhaps be stocked with a smaller number per stocking to enhance their growth, thus fulfilling the "high lake fisherman's dream of fishing a remote lake that supports lunker fish." Regulations in remote lakes could also

include a reduced limit and prohibit packing out fish. Additionally, cutthroat trout should, except where species diversity is an important consideration, be the species of choice, since cutthroat tend to grow better and live longer in mountain lakes than do rainbow trout (Cummins et al. 1976).

Outfitters and Guides Survey

The lakes in outfitter David Giles' area are producing good size trout, considerably larger than are caught by the outfitters in the Chamberlain and Big Creek areas. Stocking history is probably part of the difference as backcountry lakes in the McCall Subregion are generally stocked on a three-year rotation. If a lake was stocked last year it should have small fish, if it was stocked three years ago it should have large fish. Additional factors which are undoubtedly having an effect are: amount of natural production occurring in a lake, natural productivity of the lake and rate of fishing mortality. Low harvest rates in cutthroat lakes with no natural reproduction would benefit both catch rate and average size. Low harvest rate in a brook trout lake would probably benefit catch rate, but have a negative effect on fish growth. The McCall Subregion will follow its stocking records and catch information from backcountry outfitters for a five-year interval to see if we can modify our stocking program to improve fishing.

Evaluation of Fall Chinook Salmon on Stunted Brook Trout in Mountain Lakes

The declining condition factor of the brook trout in both lakes supports earlier observations that the age 0+ chinook, stocked in 1984, were too young to go on a fish diet at the time of planting. Thus the chinook had to compete with the established brook trout for a limited food base. Upon recommendation, age 1+ fall chinook were planted this year, but it is too soon to draw any conclusions as to the effect these larger salmonids will have on the brook trout population. The technique for stocking fall chinook into high mountain lakes using a helicopter and monsoon bucket appears to be satisfactory. No mortalities were observed during the plant and none were observed three weeks later during the survey.

Bacterial kidney disease does not appear to be a problem since the fall chinook sampled in the creel appeared to be in good condition.

LITERATURE CITED

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State of: Idaho

Project No.: F-71-R-11

Job No.: 3(MC)-b1

Name: REGIONAL FISHERY MANAGEMENT INVESTIGATIONS

Title: McCall Subregion Lowland Lakes and Reservoir Investigations

Period Covered: July 1, 1986 to June 30, 1987

ABSTRACT

Cascade Reservoir Creel Survey, **1986-87**

A creel survey was conducted on Cascade Reservoir from June 1986 through May 1987. Anglers fished 400,560 hours and captured 626,960 fish. Thirteen percent of fishing effort and fourteen percent of catch occurred during the ice fishing season. Boat anglers accounted for 68% of fishing effort and 61% of catch during the open water season. Eighty to ninety percent of the catch was yellow perch in all but the transition months of October, November and April, when rainbow trout became a large part of the catch. There were 528,000 perch, 59,500 rainbow trout and 23,500 coho salmon caught during the survey year. Fish less common in the catch included brown bullhead, chinook salmon, black crappie, smallmouth bass and the nongame species of northern squawfish and large scale suckers.

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OBJECTIVES

1. To determine angler pressure, success, and harvest to evaluate the status of Cascade Reservoir's fishery.

2. To compare angler pressure, success and harvest to 1981-82 creel survey.

RECOMMENDATIONS

1. Repeat similarly structured creel survey in 1991-92.

INTRODUCTION

The last creel survey on Cascade Reservoir was completed in 1982 (Reininger, Rieman and Horner 1983). Based on limnological data collected during the 1980-82 research project, a 300,000 acre-feet minimum pool was established to enhance salmonid survival. Additionally, there has been an increased awareness of the rapid eutrophication of the reservoir (Clark et al. 1975; Klahr 1986; and Zimmer 1983), and efforts have begun to reduce nutrient loading.

TECHNIQUES USED

A creel survey was conducted on west-central Idaho's 11,450 hectare Cascade Reservoir from June 1986 through May 1987 (Fig. 3). Three weekend days and three weekdays were chosen at random from each of the open water months. Four weekdays and five weekend days were chosen at random from the four-month ice fishing season from December through March. The year was divided into monthly time blocks during open water and one winter block. During the open water season, sample areas and times were chosen in proportion to fishing effort measured in the 1982 creel survey. We sampled one of two areas which covered the entire reservoir. These were Section A (areas 1 and 2 from the 1982 survey) and Section B (area 3 from the 1982 survey). These areas were selected with non-uniform probabilities of 0.72 and 0.28, i.e., the proportions of fishing effort which occurred in them in 1982. When sampling, we did so either in the a.m. or p.m. These times were selected with equal probabilities, as the effort in these two time periods was equal in 1982. Daily samples of fishing effort were expanded to entire reservoir day estimates by dividing the estimates by the appropriate section probability and multiplying by the average number of hours between sunrise and sunset for the open-water time block being sampled.

Thus an estimate of fishing effort on a given day was the number of anglers counted divided by section probability times the hours between sunrise and sunset. Separate estimates were made for boat and bank

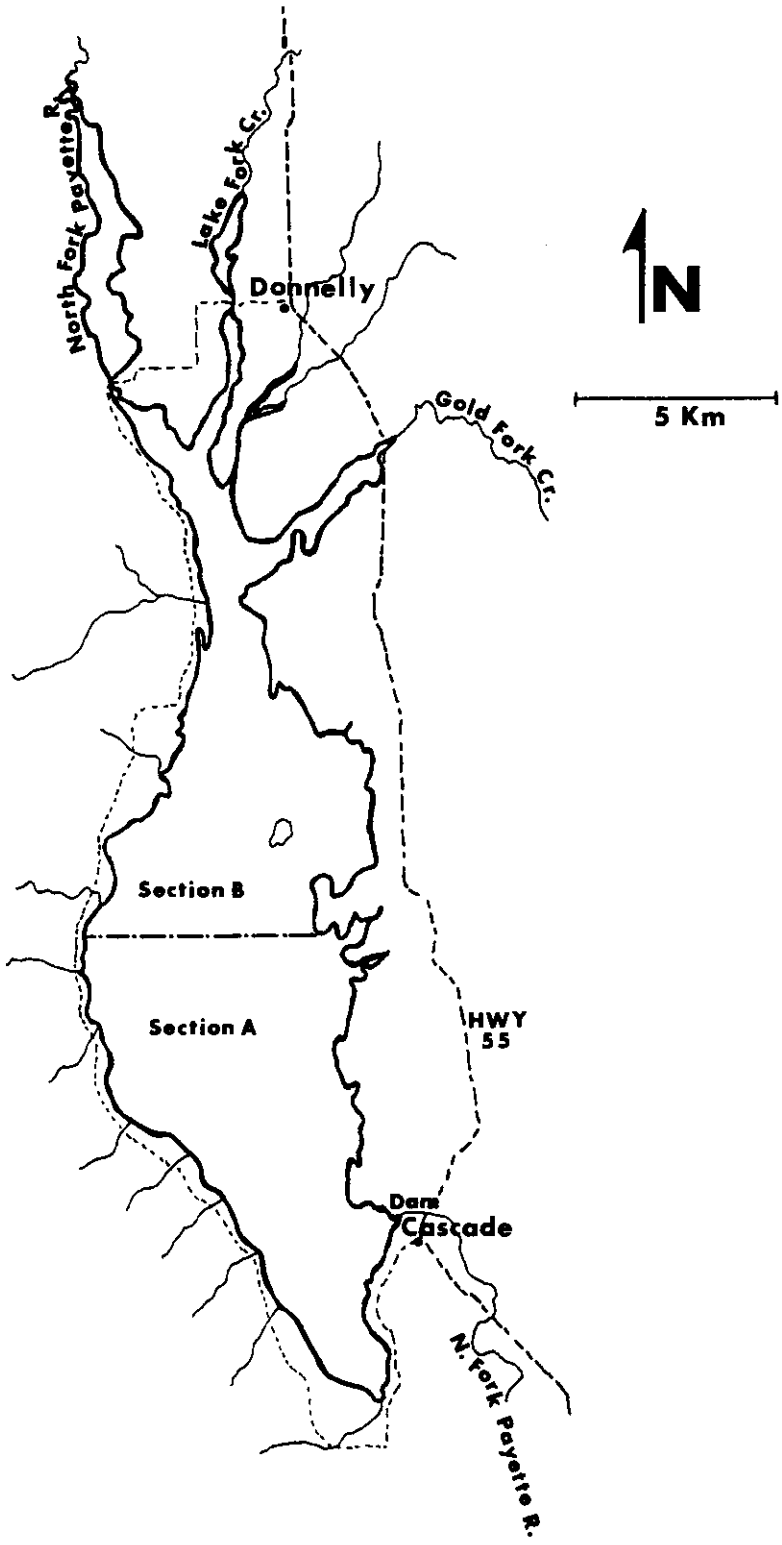

Figure 3. Cascade Reservoir in west-central Idaho showing lake sections, major tributaries, dam and communities of Cascade and Donnelly.

anglers. During the ice fishing season, the entire lake was surveyed to measure fishing effort. Instantaneous angler counts were then multiplied by the average number of hours between one hour after sunrise and one hour before sunset, assuming this to be the general time interval within which ice fishing occurred. The catch rate (fish/hour) was calculated as the total number of fish caught by interviewed anglers divided by the total numbers of hours they expended for the catch. Daily catch was the product of fishing effort and catch rate. Sampling was stratified by weekday and weekend.

Monthly estimates for the entire fishery as well as separated by boat and bank anglers were calculated based on the below sequence of equations. First, mean daily values of fishing effort (F), catch rate (C/F) and catch (C) were calculated along with their respective standard deviations (sd) of the mean values. These values were calculated separately for bank and boat angling on weekends and weekdays.

Data from open-water time blocks are based on **six** samples per time block, three each for weekdays and weekends. Data is summarized separately for weekend boats, weekend bank, weekday boat and weekday bank. The following average daily statistics are used to calculate time block values:

Weekend-boat
Means
$F_{boat\ we}$ $C/F_{boat\ we}$ $C_{boat\ we}$

Standard deviation of means
$sdF_{boat\ we}$ $sdC/F_{boat\ we}$ $sdC_{boat\ we}$

Weekday-boat
Means
$F_{boat\ wd}$ $C/F_{boat\ wd}$ $C_{boat\ wd}$

Standard deviation of mean
$sdF_{boat\ wd}$ $sdC/F_{boat\ wd}$ $C_{boat\ wd}$

Weekend-bank
Means
$F_{bank\ we}$ $C/F_{bank\ we}$ $C_{bank\ we}$

Standard deviation of means
$sdF_{bank\ we}$ $sdC/F_{bank\ we}$ $C_{bank\ we}$

Weekday-bank
Means
$F_{bank\ wd}$ $C/F_{bank\ wd}$ $C_{bank\ wd}$

Standard deviation of means
$sdF_{bank\ wd}$ $sdC/F_{bank\ wd}$ $sdC_{bank\ wd}$

we = weekend and wd = weekday.

Calculations for mean daily estimates of F, C/F and C and their respective standard deviations for WEEKEND data.

$$F_{we} = F_{\underset{we}{Boat}} + F_{\underset{we}{bank}}$$

$$C/F_{we} = C/F_{\underset{we}{boat}}\left(\frac{F_{\underset{we}{boat}}}{F_{we}}\right) + C/F_{\underset{we}{bank}}\left(\frac{F_{\underset{we}{bank}}}{F_{we}}\right)$$

$$C_{we} = C_{\underset{we}{boat}} + C_{\underset{we}{bank}}$$

Calculations of standard deviation (sd) for the above estimates were made as follows:

$$sdF_{we} = sdF_{\underset{we}{boat}} + sdF_{\underset{we}{bank}}$$

$$sdC/F_{we} = \sqrt{\left(sdC/F_{\underset{we}{boat}}\right)^2\left(\frac{F_{\underset{we}{boat}}}{F_{we}}\right)^2 + \left(sdC/F_{\underset{we}{bank}}\right)^2\left(\frac{F_{\underset{we}{bank}}}{F_{we}}\right)^2}$$

$$sdC_{we} = sdC_{\underset{we}{boat}} + sdC_{\underset{we}{bank}}$$

Weekday daily estimates are calculated the same way.

Stratified daily estimates incorporate both mean weekend and weekday estimates and their respective standard deviations. The following example month has 10 weekend (including holidays) days and 20 weekdays:

Weekend weight - (10/30) = ^{Wt}we
Weekday weight = (20/30) = ^{Wt}wd

Estimates:

$$F_{daily} = F_{we}\ (Wt_{we}) + F_{wd}\ (Wt_{wd})$$

$$C/F_{daily} = C/F_{we}\ (Wt_{we}) + C/F_{wd}\ (Wt_{wd})$$

$$C_{daily} = C_{we}\ (Wt_{we}) + C_{wd}\ (Wt_{wd})$$

Monthly estimates of F, C/F and C are calculated as follows (there are 30 days in this example month):

Estimates:

$$F_{month} = F_{daily} \times 30 \text{ days}$$

$$C/F_{month} = C/F_{daily} \quad \text{(i.e., they are the same)}$$

$$C_{month} = C_{daily} \times 30 \text{ days}$$

Standard errors:

$$sdF_{month} = sdF_{daily} \times 30 \text{ days}$$

$$sdC/F_{month} = sdC/F_{daily} \quad \text{(i.e., they are the same)}$$

$$sdC_{month} = sdC_{daily} \times 30 \text{ days}$$

Calculations for mean daily estimates of F, C/F and C and their respective standard deviations for BOAT data.

Estimates:

$$F_{boat} = F_{\substack{boat \\ we}} \left(Wt_{we}\right) + F_{\substack{boat \\ wd}} \left(Wt_{wd}\right)$$

$$C/F_{boat} = C/F_{\substack{boat \\ we}} \left(Wt_{we}\right) + C/F_{\substack{boat \\ wd}} \left(Wt_{wd}\right)$$

$$C_{boat} = C_{\substack{boat \\ we}} \left(Wt_{we}\right) + C_{\substack{boat \\ wd}} \left(Wt_{wd}\right)$$

Standard errors:

$$sdF_{boat} = \sqrt{sdF_{\substack{boat \\ we}}^{2}\left(Wt_{we}^{2}\right) + sdF_{\substack{boat \\ wd}}^{2}\left(Wt_{wd}^{2}\right)}$$

$$sdC/F_{boat} = \sqrt{sdC/F_{\substack{boat \\ we}}^{2}\left(Wt_{we}^{2}\right) + sdC/F_{\substack{boat \\ wd}}^{2}\left(Wt_{wd}^{2}\right)}$$

$$sdC_{boat} = \sqrt{sdC_{\substack{boat \\ we}}^{2}\left(Wt_{we}^{2}\right) + sdC_{\substack{boat \\ wd}}^{2}\left(Wt_{wd}^{2}\right)}$$

BANK daily estimates are calculated the same way.

As can be seen from the above equations, monthly catch rate is calculated in the same manner as is effort and catch. This technique is referred to as the "mean of ratios estimator" (Malvestuto 1985, pg 412) as opposed to a total ratio estimator which would use a single ratio, dividing the sum of all measured catch for the time block by the sum of all measured effort. The disadvantage of the latter technique is that it requires that measured effort on each sampling day be proportional to the actual effort for each day in the time block.

The estimates of catch rate and catch in this survey do not include fish considered too small to keep, nor do they include those generally considered not desirable to keep, such as squawfish and suckers. Nongame fish, however, are included in the estimates of catch composition and number captured by species as a means of demonstrating their relative abundance in the catch.

FINDINGS

Fisheries personnel conducted a creel survey on Cascade Reservoir from June 1986 through May 1987. An estimated 400,560 hours of fishing effort were expended to capture 626,960 fish (Table 8). Average catch rate was 1.8 fish per hour. Thirteen percent of fishing effort and fourteen percent of catch occurred during the December through March ice fishery.

During the open water season (April through November), boat fishing accounted for 68% of fishing effort and 61% of catch (Table 9). Effort from boat anglers exceeded that of bank anglers in all open water months except November and April, transition months between ice and open water seasons. May had the largest catch rate, 4.0 and 4.7 fish per hour, for boat and bank anglers, respectively. Lowest catch rates occur during April, October and November (the cool but ice-off seasons). Monthly catches were highest during the summer months of May through August.

Table 8. Monthly statistics of fishing effort, catch rate and catch and 90Z confidence intervals at Cascade Reservoir from June 1986 through June 1987.

1986	Effort (hours)	Catch rate (fish/hour)	Catch (fish)
June	54,940 ±42%	1.4 ± 67%	88,040 ± 82%
July	74,130 ±73%	1.4 ± 31%	93,830 ± 71%
August	70,230 ±74%	2.2 ± 24%	149,660 ± 66%
September	22,360 ±84%	1.2 ± 41%	29,490 ±127%
October	19,880 ±63%	0.5 ± 5%	9,150 ± 73%
November	3,980 ±28%	0.4 ±119%	1,740 ±137%
Winter*	50,810 ±46%	1.4 ± 51%	88,370 ± 59%
April	44,210 ±74%	0.8 ± 95%	40,730 ±142%
May	53,080 ±32%	4.3 ± 47%	125,950 ± 27%
Total	400,560	1.8	626,960

* The winter months are December, January, February and March.

Table 9. Monthly statistics of effort, catch rate and catch and 90Z confidence intervals for boat and bank angling.

	Effort (hours)	Catch rate (fish/hour)	Catch (fish)
June			
Boat	30,100 ± 54%	1.5 ±106%	51,800 ±132%
Bank	24,800 ± 67%	1.3 ± 44%	36,200 ± 64%
July			
Boat	54,600 ± 80%	1.1 ± 30%	52,500 ± 74%
Bank	19,500 ± 55%	2.1 ± 58%	41,300 ± 98%
August			
Boat	58,900 ± 84%	2.7 ± 24%	141,300 ± 64%
Bank	10,400 ± 42%	0.8 ± 47%	8,300 ± 36%
September			
Boat	15,200 ±116%	1.3 ± 53%	22,o00 ±151%
Bank	7,100 ± 31%	1.0 ± 75%	7,500 ± 68%
October			
Boat	9,700 ± 52%	0.6 ± 53%	5,100 ± 41%
Bank	9,400 ± 87%	0.4 ± 75%	4,100 ±116%
November			
Bank	3,980 ± 28%	0.4 ±119%	1,740 ±137%
Winter*			
Ice	50,800 ± 46%	1.4 ± 51%	88,400 ± 59%
April			
Boat	9,200 ±128%	0.5 **	2,800 ±159%
Bank	35,000 ± 61%	0.9 ± 95%	37,900 ±141%
May			
Boat	35,100 ± 20%	4.0 ± 65%	54,560 ± 10%
Bank	18,000 ± 55%	4.7 ± 58%	71,390 ± 38%
Annual			
Boat	267,580		330,060
Bank	128,180		206,690
Ice	50,800		88,400

* The winter months are December, January, February and March.
**Only one day of data.

Highest catch rates were for perch among those anglers who sought a particular species (Table 10). Monthly perch catch rates (perch/hour) for boat anglers ranged from 1.4 in July to 3.9 in August and for bank anglers from 0.6 in August to 5.7 in May. Catch rates for rainbow trout were much lower, ranging from 0.1 in August to 0.6 in May. for boat anglers and from near zero in July to 1.3 in June for bank anglers. Data was not available for catch rate of target species from October through March. During the open water season, the greatest catch rate for coho salmon was for boat anglers in August.

Although in most months, 20 to 40Z of anglers fished for whatever was biting, in July and August the majority of anglers were after perch (Table 11) . During the seasonal transition months, most anglers sought trout. Only in August was there a significant amount of effort directed toward coho.

Eighty to ninety percent of the catch was perch in all but the transition months of October, November and April, when rainbow trout became a large part of the catch (Tables 12 and 13). There were 528,000 perch, 59,500 rainbow trout and 23,500 coho salmon caught during the survey year. Additionally, there was an estimated harvest of 880 chinook salmon which occurred only during the ice fishery and 7,500 bullhead catfish. The nongame species of northern squawfish and large scale suckers accounted for a similarly small part of the catch, 8,700 and 1,200 fish, respectively.

Mean length of perch increased continuously from midsummer 1986 until spring 1987, from 19 cm in August to 24 cm in April (Table 14). The larger age 2+ and older perch probably died at a high rate after the spring spawning season. Larger perch were not common in the midsummer fishery (Figs. 4-8).

Hatchery-reared rainbow trout averaged 31 to 36 cm in length among monthly samples. The month with the largest percent of trout larger than 40 cm was November (Figs. 9-13).

The only large sample of coho salmon was from August. Mean length was 36 cm (Fig. 14).

DISCUSSION

In 1973, fishing effort during the interval May 13 to September 1 was 121,100 hours. Comparatively, it was 230,120 hours during the present survey. During these two periods, catch increased from 181,400 fish to 404, 600 fish. Nine percent of the 1973 catch was squawfish compared with 1.3Z in 1986-87. Rainbow trout representation has decreased from 5Z to 4Z and coho salmon from 8Z to 5Z. Perch has increased substantially, going from 63Z in 1973 to 89Z in 1986-87.

There were 414,300 hours of fishing effort expended in the 1982 survey compared with 400,560 in 1986-87, i.e., very little change in the estimates. Ice fishing effort increased from near 40,000 hours in 1982

Table 10. Monthly catch rates (fish/hour) for target species (groups) for boat and bank angling. Ninety percent confidence intervals are presented where at least four days of data was available.

	Perch	Anything	Trout	Salmonids	Coho
June					
Boat	2.6 ±87%	1.5 ± 88%	0.2	0.3	0.2
Bank	1.8 ±10%	0.4	1.3	0	0.3
July					
Boat	1.4 ±49%	1.3 ± 89%	0.2 ±50%	0.3	0.3
Bank	2.3 ±49%	0.7	0	0.3	0.3
August					
Boat	3.9 ±57%	3.2	0.1	0.1	0.4
Bank	0.6 ±37%	0.0	--	--	--
September					
Boat	3.5	0.3	0.3	0.4	--
Bank	3.2	1.3	0.3	1.0	0
Data omitted October through March					
April					
Boat	2.5	0.1	0.3	--	--
Bank	2.9	1.7 ± 60%	0.2 ±94%	0	--
May					
Boat	3.6 ±76%	2.7 ±159%	0.6	0.8	--
Bank	5.7 ±67%	2.2 ± 37%	0.1	0	--

Table 11. Monthly estimates of percentage fishing effort directed toward each species group for boat and bank anglers.

	Perch	Anything	Trout	Salmonids	Coho
June					
Boat	25	43	21	10	2
Bank	43	11	36	3	8
July					
Boat	54	12	20	3	11
Bank	70	4	6	9	11
August					
Boat	60	4	11	5	20
Bank	96	4	--	--	--
September					
Boat	20	23	28	29	--
Bank	10	36	36	11	5
Data omitted from survey October through March					
April					
Boat	6	18	76	0	0
Bank	3	26	70	1	0
May					
Boat	33	23	29	15	--
Bank	52	48	--	<1	--

Table 12. Monthly estimates of percent catch compositon for boat and bank anglers.

	Hatchery rainbow	Natural rainbow	Coho	Chinook	Yellow perch	Bullhead	Squawfish	Suckers
June								
Boat	5	3	6	0	82	<1	3	0
Bank	0	<1	5	0	91	2	2	0
July								
Boat	4	<1	13	0	81	0	2	0
Bank	0	<1	<1	0	98	<1	1	0
August								
Boat	1	<1	5	0	92	2	1	0
Bank*	0	0	0	0	87	0	0	0
September								
Boat	19	5	0	0	75	1	<1	0
Bank	15	0	0	0	81	5	0	0
October								
Boat	65	12	4	0	4	1	14	0
Bank	47	6	5	0	34	6	2	1
November								
Boat	No recorded effort							
Bank	91	7	0	0	0	0	2	0
Winter*								
Ice	7	<1	2	1	90	<1	<1	0
April								
Boat	33	0	7	0	60	0	0	
Bank*	41	1	1	0	44	6	4	3
May								
Boat	2	0	<1	0	96	<1	1	1
Bank	19	0	3	0	77	<1	1	<1

*13% of catch from the bank in August was smallmouth bass; <1% of the catch from the bank in April was black crappie and mountain whitefish.

Table 13. Monthly estimates of catch by species for boat and bank anglers at Cascade Reservoir from June 1986 through May 1987.

	Hatchery rainbow	Natural rainbow	Coho	Chinook	Yellow perch	Bullhead	Squawfish	Suckers
June								
Boat	2,600	1,600	3,100	0	42,500	160	1,600	0
Bank	0	100	1,800	0	32,900	720	720	0
July								
Boat	2,100	190	6,800	0	42,500	0	1,100	0
Bank	0	140	140	0	40,500	140	400	0
August								
Boat	1,400	130	7,100	0	130,000	2,800	1,400	0
Bank*	0	0	0	0	7,200	0	0	
September								
Boat	4,200	1,100	0	0	16,500	220	130	0
Bank	1,100	0	0	0	6,100	380	0	0
October								
Boat	3,300	610	200	0	200	50	700	0
Bank	1,900	250	210	0	1,400	250	80	40
November								
Bank	3,600	280	0	0	0	0	80	0
Winter*								
Ice	6,200	110	1,800	880	79,500	60	60	
April								
Boat	920	0	200	0	1,650	0	0	0
Bank	15,500	380	380	0	16,700	2,300	1,500	1,100
May								
Boat	10,400	0	1,640	0	42,000	180	550	90
Bank	1,430	0	120	0	68,500	240	360	0
Total	54,650	4,890	23,490	880	528,150	7,500	8,680	1,230
	9%	<1%	4%	<1%	84%	1%	1%	<1%

*360 smallmouth bass

Table 14. Length statistics for four fish species in Cascade Reservoir in months when a large sample was available.

	n	$\bar{X}$(cms)	sD
Perch			
August 1986	108	18.9	2.6
September 1986	70	20.6	2.3
October 1986	65	21.2	3.3
Winter 1986-87	398	21.6	3.7
April 1987	64	23.9	3.9
Hatchery Rainbow Trout			
May 1986	22	32.5	5.7
September 1986	52	30.5	5.5
November 1986	43	35.7	5.6
Winter 1986-87	47	33.0	4.3
April 1987	165	34.8	4.9
Coho			
August 1987	33	35.6	1.8

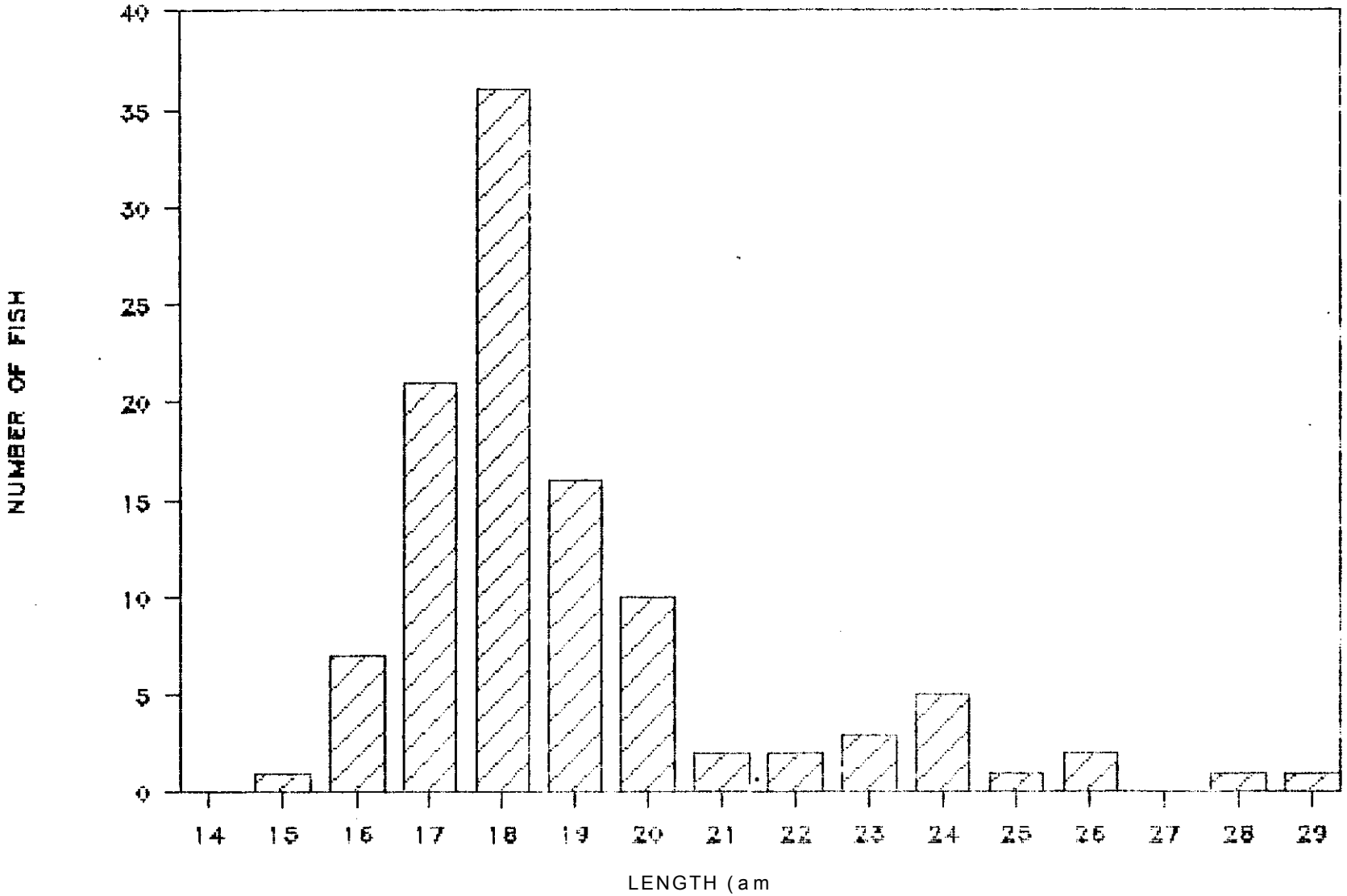

Figure 4. Length frequency distribution of yellow perch in Cascade Reservoir in August 1986.

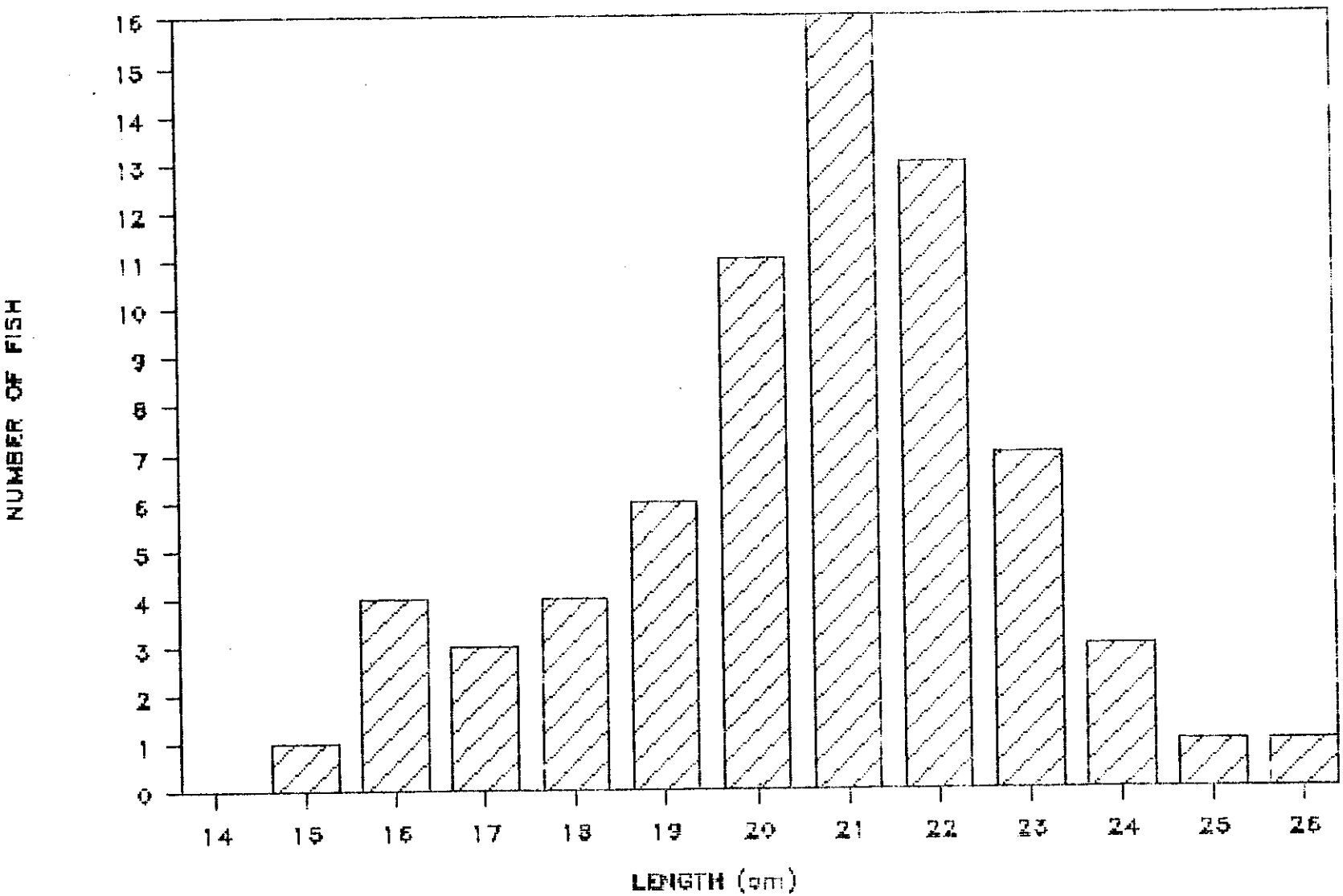

Figure 5. Length frequency distribution of yellow perch in Cascade Reservoir in September 1986.

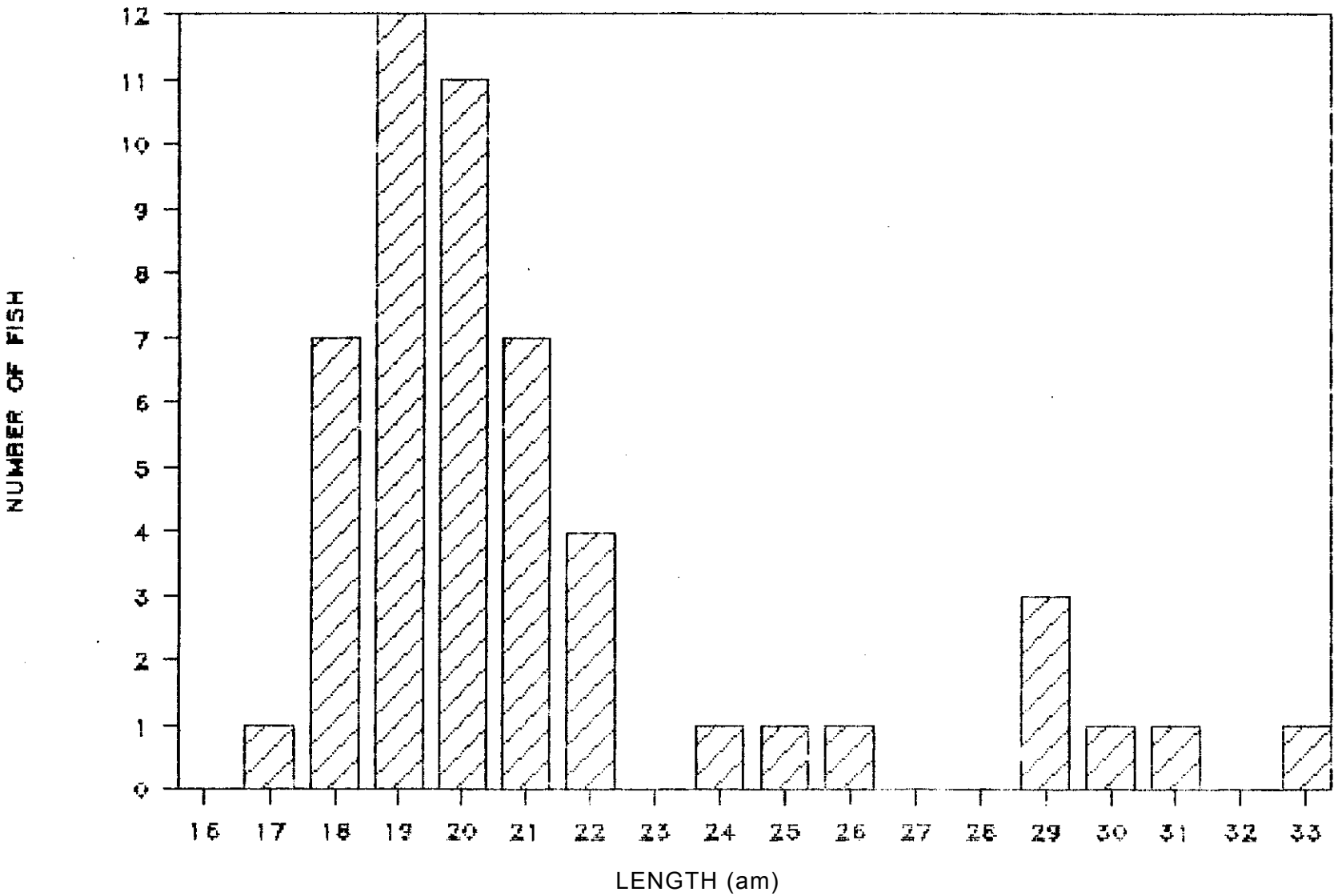

Figure 6. Length frequency distribution of yellow perch in Cascade Reservoir in October 1986.

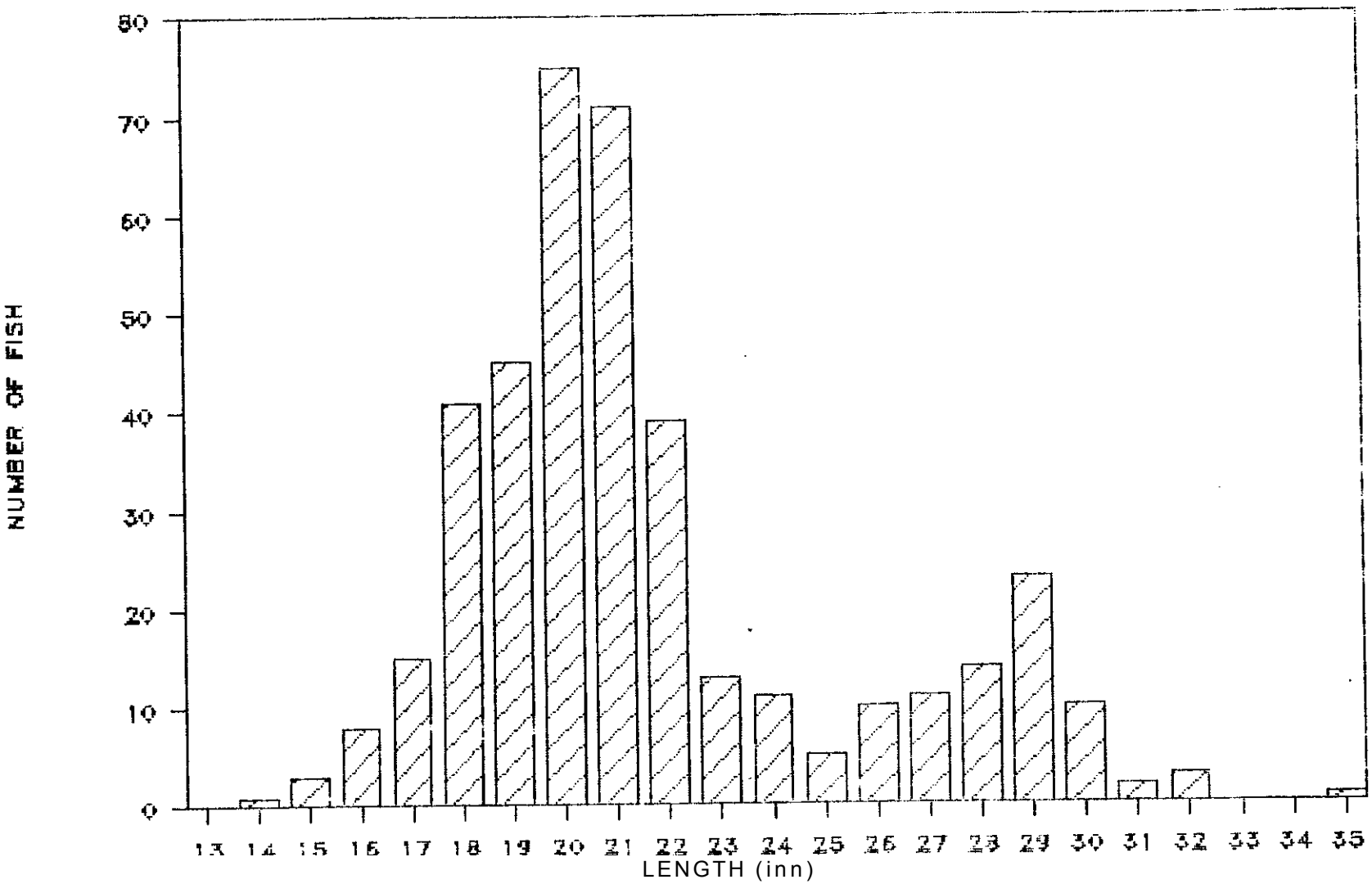

Figure 7. Length frequency distribution of yellow perch in Cascade Reservoir during the winter of 1986-87.

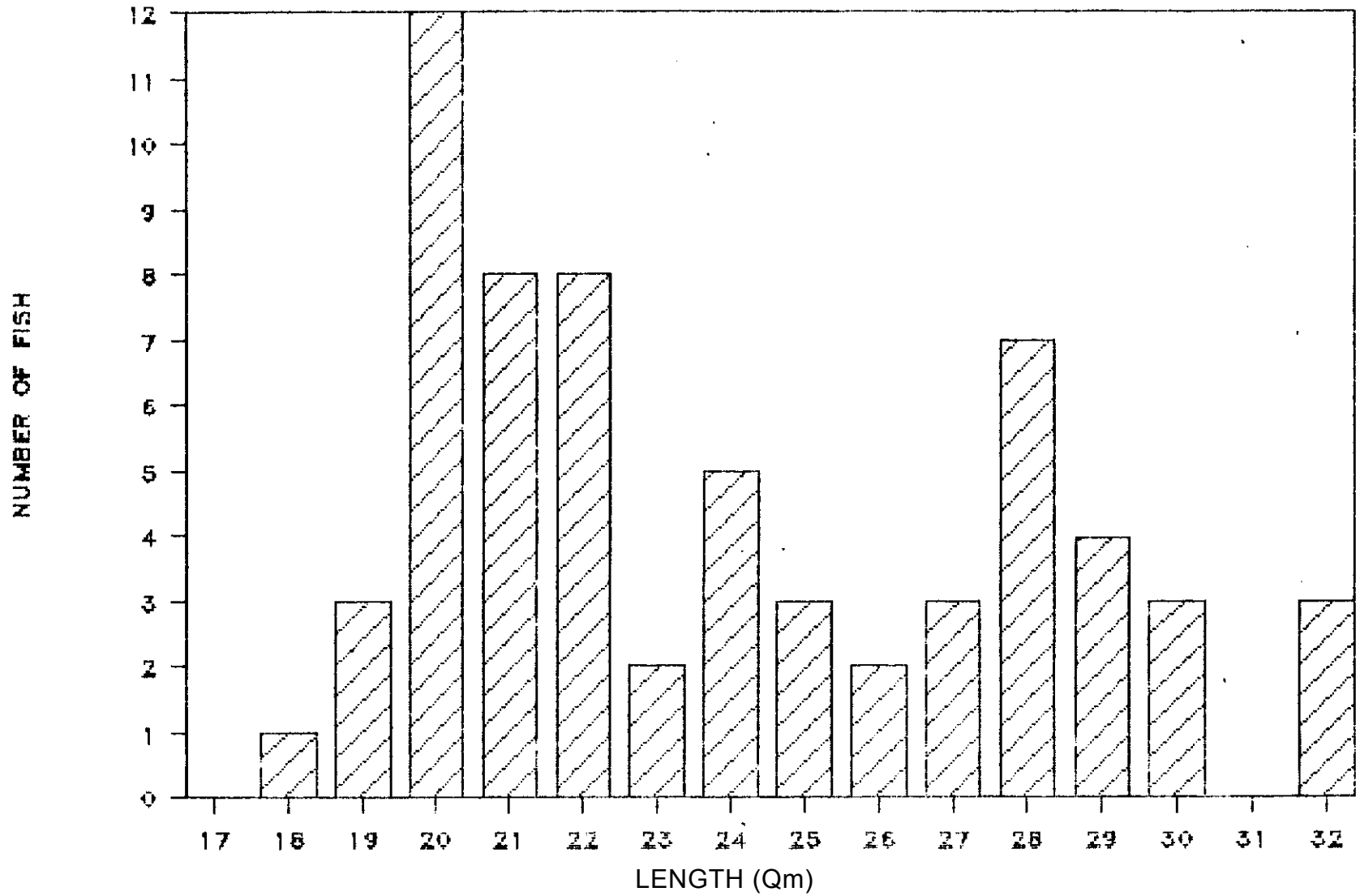

Figure 8. Length frequency distribution of yellow perch in Cascade Reservoir in April 1987.

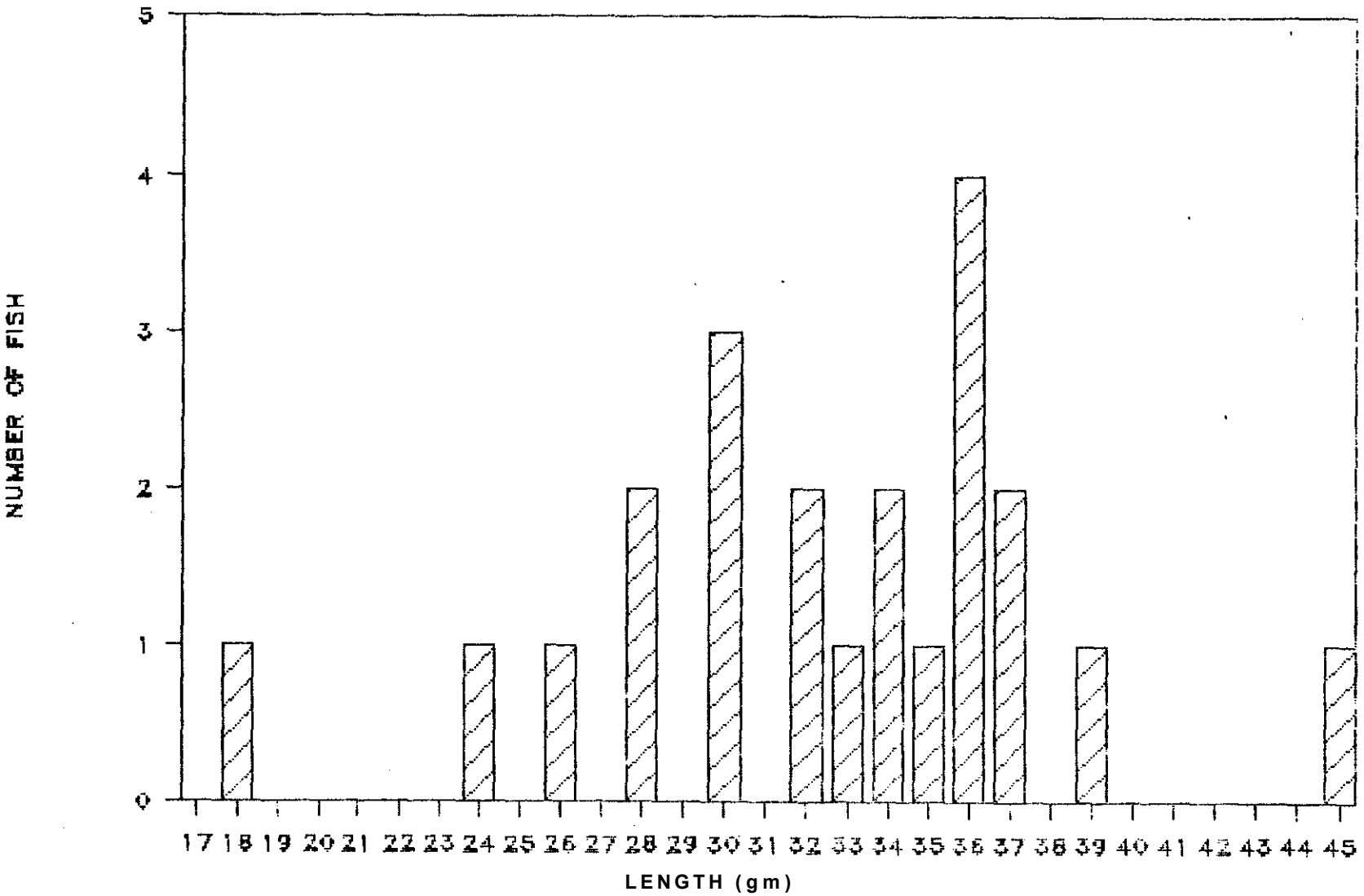

Figure 9. Length frequency distribution of hatchery-reared rainbow trout in Cascade Reservoir, May 1986.

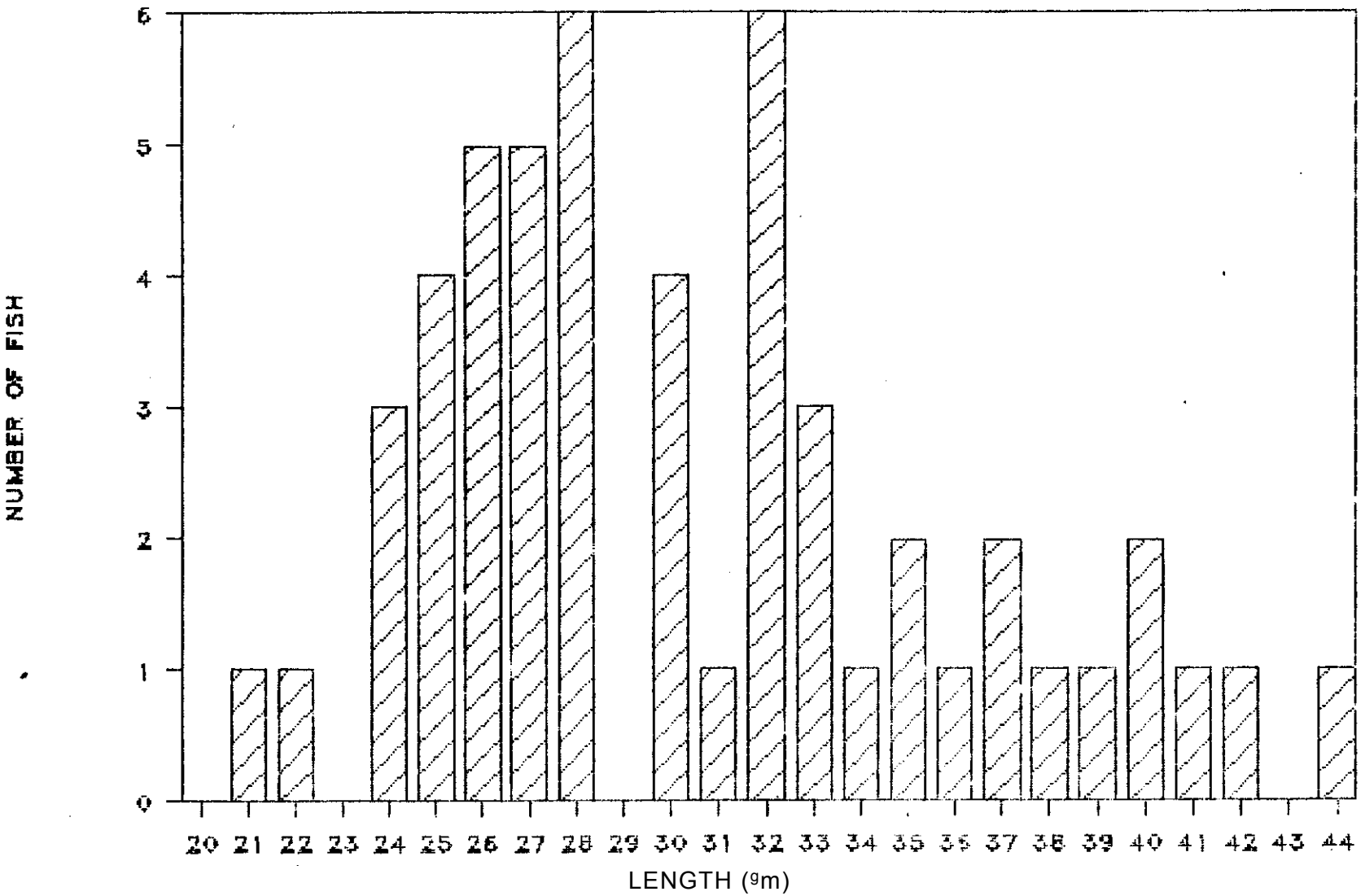

Figure 10. Length frequency distribution of hatchery-reared rainbow trout in Cascade Reservoir, September 1986.

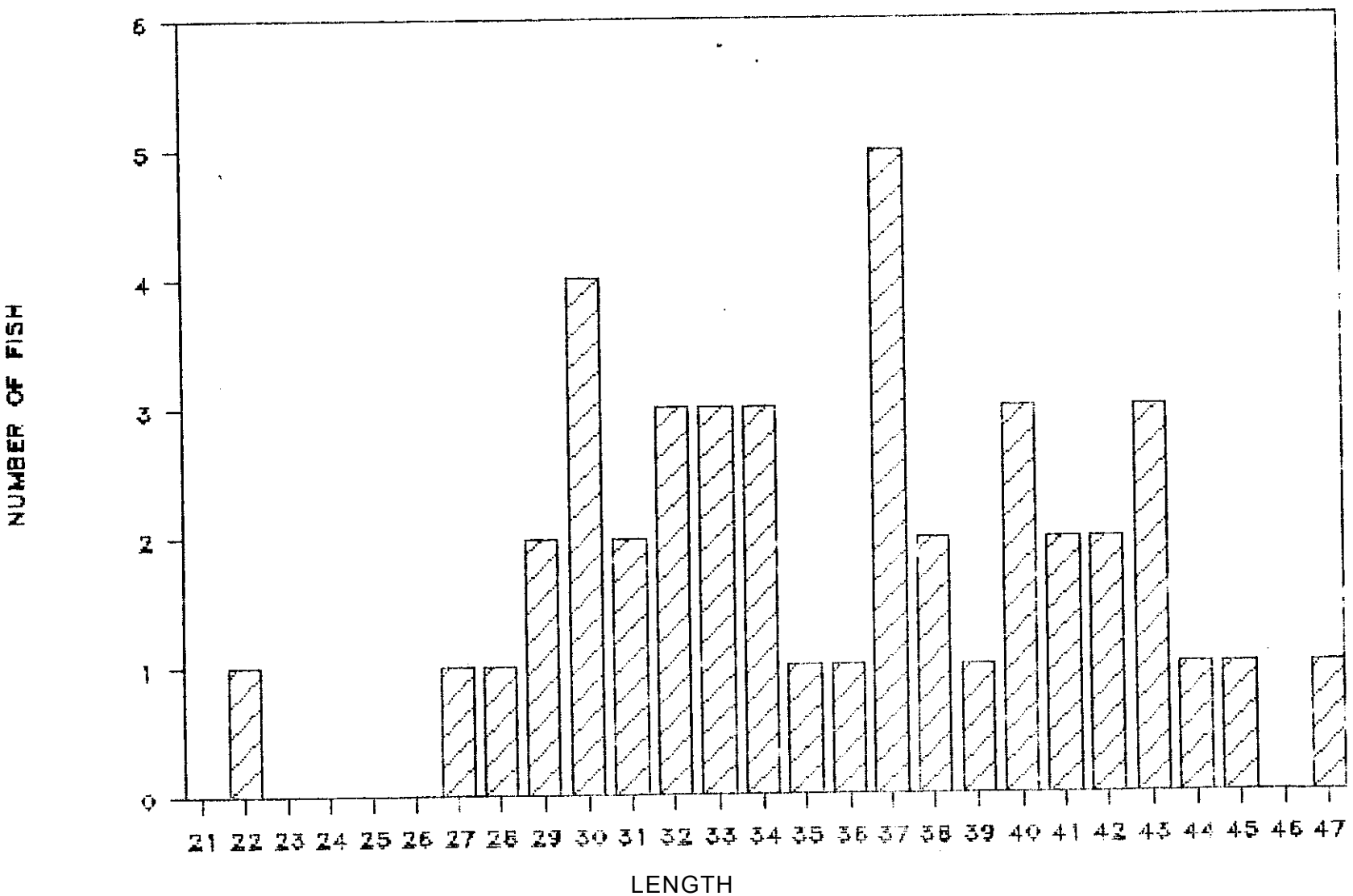

Figure 11. Length frequency distribution of hatchery-reared rainbow trout in Cascade Reservoir, November 1986.

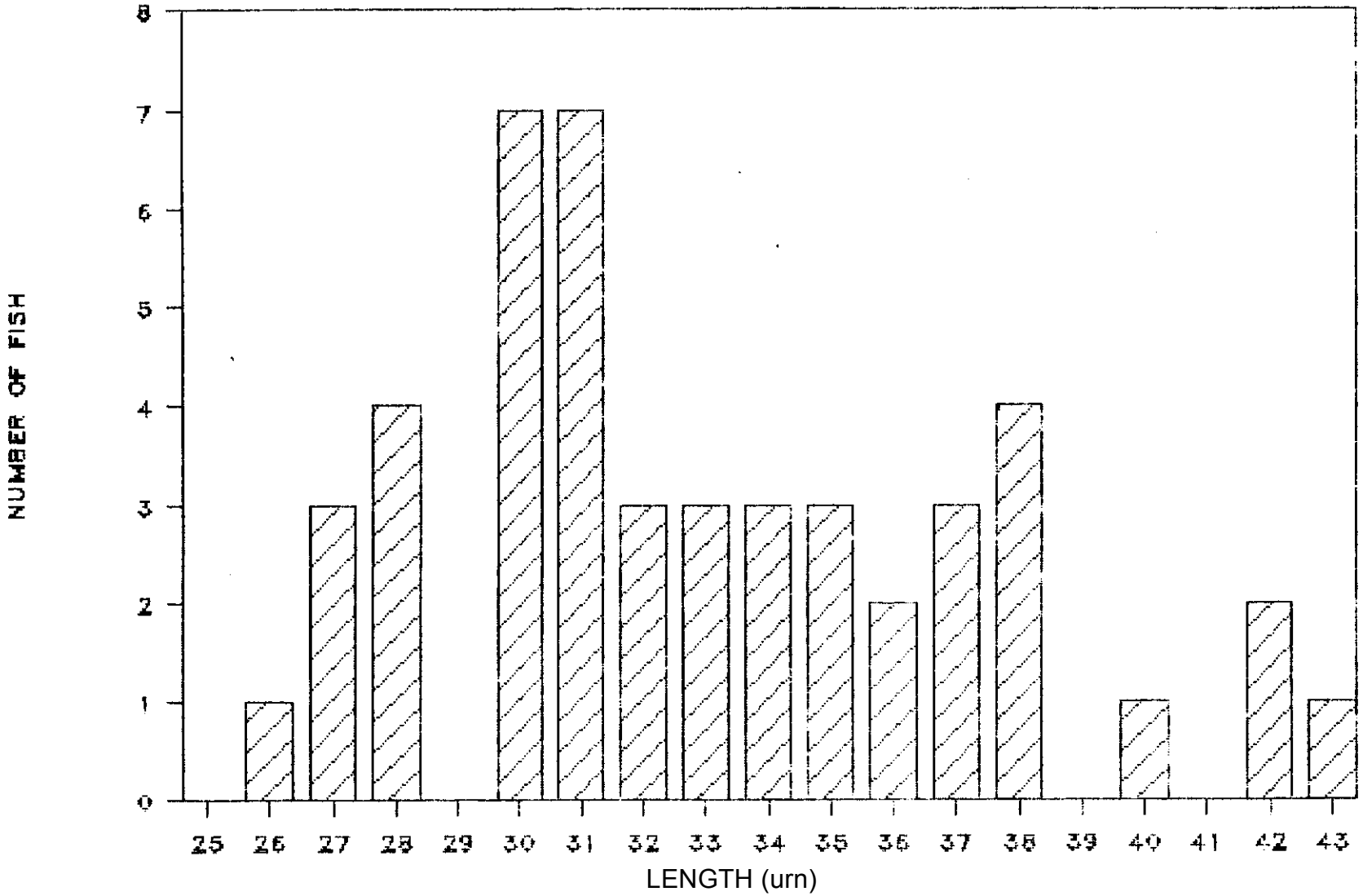

Figure 12. Length frequency distribution of hatchery-reared rainbow trout in Cascade Reservoir during winter of 1986-87.

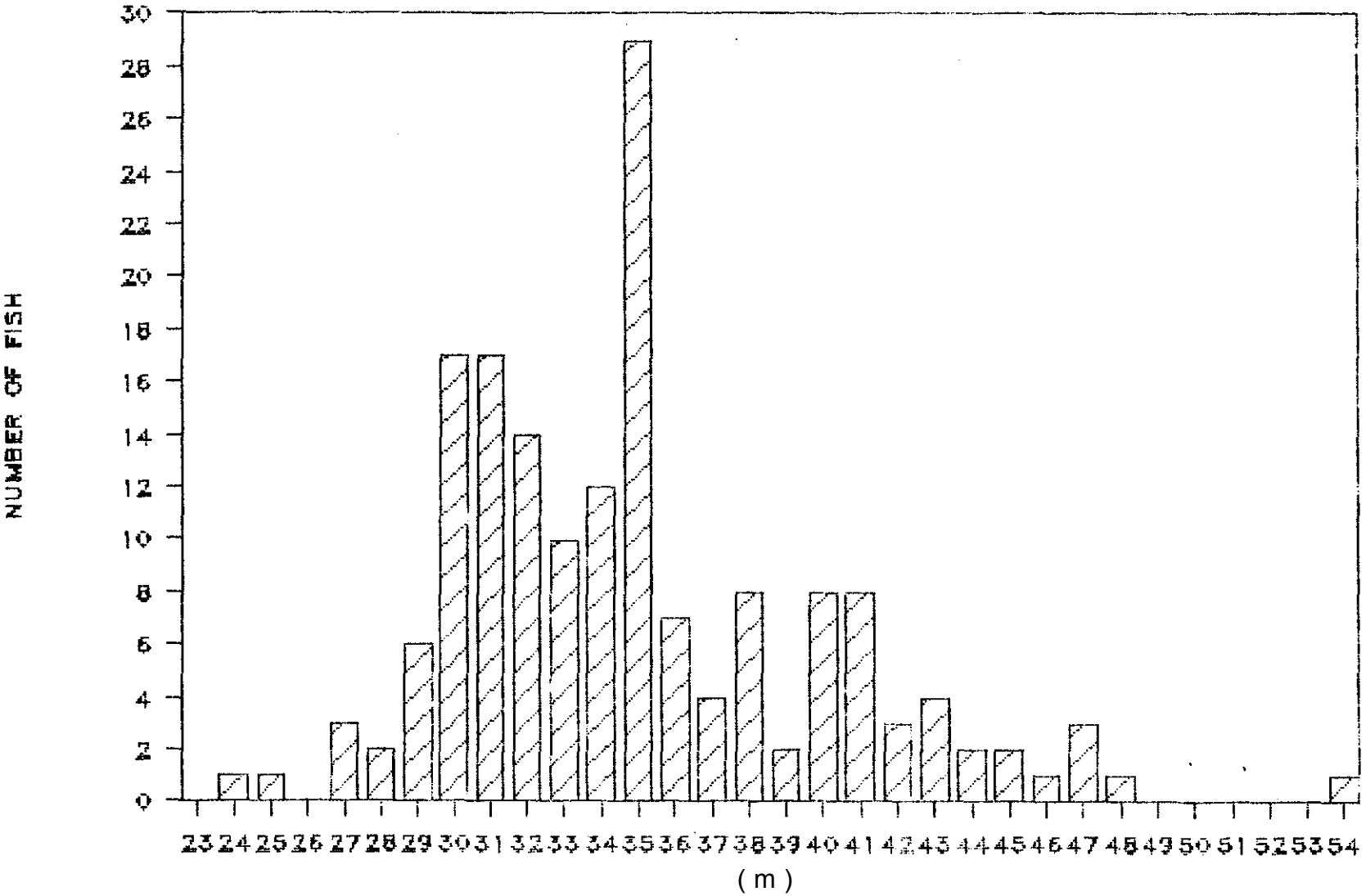

Figure 13. Length frequency distribution of hatchery-reared rainbow trout in Cascade Reservoir, April 1987.

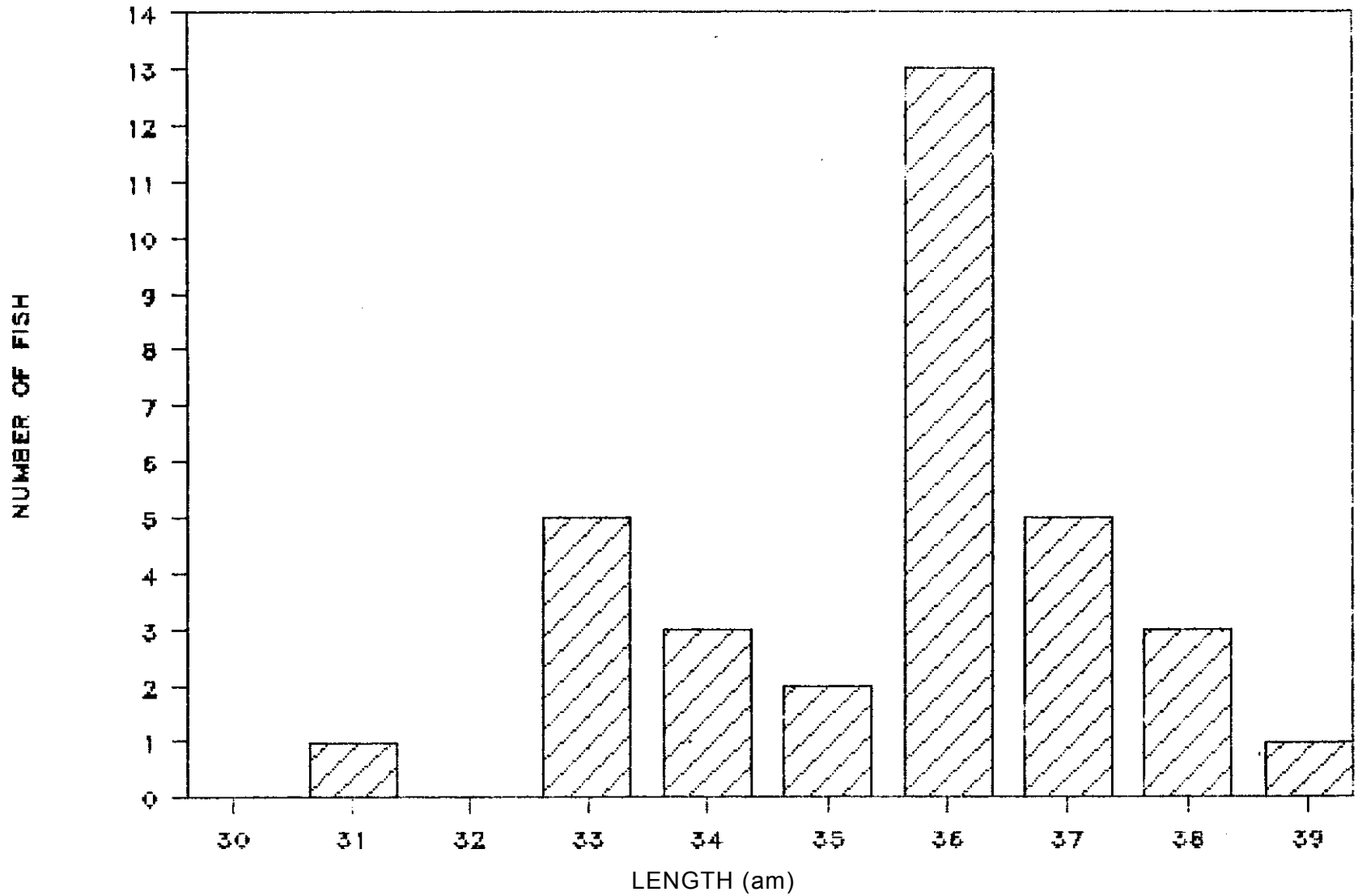

Figure 14. Length frequency distribution of coho salmon in Cascade Reservoir, August 1986.

to 51,000 hours in 1986-87. In 1982, 10.5% of the rainbow trout catch appeared to be natural or from hatchery fingerling plants. In 1986-87, 8% of the rainbow trout appeared to be natural or from fingerling plants. Based on a 500,000 release of fingerling coho in 1985, there was a 5% return to the creel.

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State of: Idaho

Project No.: F-71-R-11

Job No.: 3(MC)-b2

Name: REGIONAL FISHERY MANAGEMENT INVESTIGATIONS

Title: McCall Subregion Lowland Lakes and Reservoir Investigations

Period Covered: July 1, 1986 to June 30, 1987

ABSTRACT

McCall Subregion personnel made a spring and fall field trip to Hells Canyon and Oxbow reservoirs to collect baseline information on the fisheries of these reservoirs, with special emphasis on the smallmouth bass fisheries which were in their first year of a 12" minimum size limit. Information was obtained with gill nets, electrofishing and by interviewing anglers.

There were 16 fish species caught in Hells Canyon and 12 species caught in Oxbow Reservoir. Species captured most frequently with electrofishing, gill netting and angling were smallmouth bass, chiselmouth chub and black crappie, respectively. Although the majority of the electrofishing catch was game fish, gill net catches were mainly nongame fish. Anglers caught black crappie, channel catfish, rainbow trout, smallmouth bass and coho salmon. Proportional stock densities of smallmouth bass indicate quality size, although sample sizes were small and there appeared to be a large number of sub-stock size (less than 18 cm) bass in the electrofishing samples.

An opening weekend creel survey was conducted on Horsethief Reservoir. Anglers fished 7,940 hours and caught 6,271 rainbow trout and 1 brook trout. Angler use increased 28Z above that on opening weekend in 1985 while catch decreased 30%. Boat, bank and float tube anglers had average catch rates of 0.9, 0.8 and 0.5 fish per hour, respectively. Eight percent of the 1986 opening weekend catch was from the 1984 fingerling release; the majority of the catch coming from the 1985 fingerling release. Twenty-four percent and nine percent were Shasta and Mount Lassen strain rainbow trout which were stocked in equal numbers. The condition factor of these two strains were similar, i.e., 0.92 and 0.86, respectively. The light green grit marks on the McConaughy strain were not observable. A 1986 gill net sample containing 68 trout with observable grit marks contained 22% Shasta, 47% Mount Lassen and 31% McConaughy strains. The higher percent of Mount Lassen is in agreement with observation of strains in the opening weekend catch.

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INTRODUCTION

Oxbow and Hells Canyon reservoirs are mainstream impoundments of the Snake River, located in western Adams County (Fig. 15). They were created in 1961 and 1967, respectively. They have a total surface area of 3,650 acres and volume of 228,000 acre-feet at full pool.

The Idaho Department of Fish and Game Fisheries Management Plan (1983) calls for trophy smallmouth bass management in both reservoirs. A 12-inch minimum size limit on smallmouth and largemouth bass was put into affect on both reservoirs in 1986 as part of a statewide bass regulation.

Horsethief Reservoir is a 110 ha impoundment on Horsethief Creek, 12 km east of Cascade, Idaho.

Department personnel have estimated fishing effort, catch rate and catch at the Department-owned Horsethief Reservoir during opening weekend of fishing season for the last 13 years.

This study provides trend data on these fishery parameters and documents the effects of stocking size, density and strain of hatchery-reared trout. Data from 1986 completes the evaluation of Shasta, Mt. Lassen and McConaughy strains of rainbow trout in Horsethief Reservoir.

OBJECTIVES

1. To obtain an understanding of the fisheries in Oxbow and Hells Canyon reservoirs.

2. To establish baseline data on size structure of smallmouth bass to enable evaluation of the 12-inch minimum size regulation.

3. To determine the need for more specific investigations and alternative management.

4. To monitor angler pressure, success and harvest on Horsethief Reservoir.

5. To evaluate effects of stocking size, density and strain of hatchery-reared trout on contribution to harvest.

RECOMMENDATIONS

1. Sample Hells Canyon and Oxbow reservoirs more extensively in the spring of 1987 to continue evaluation of the 12-inch minimum size limit on smallmouth bass.

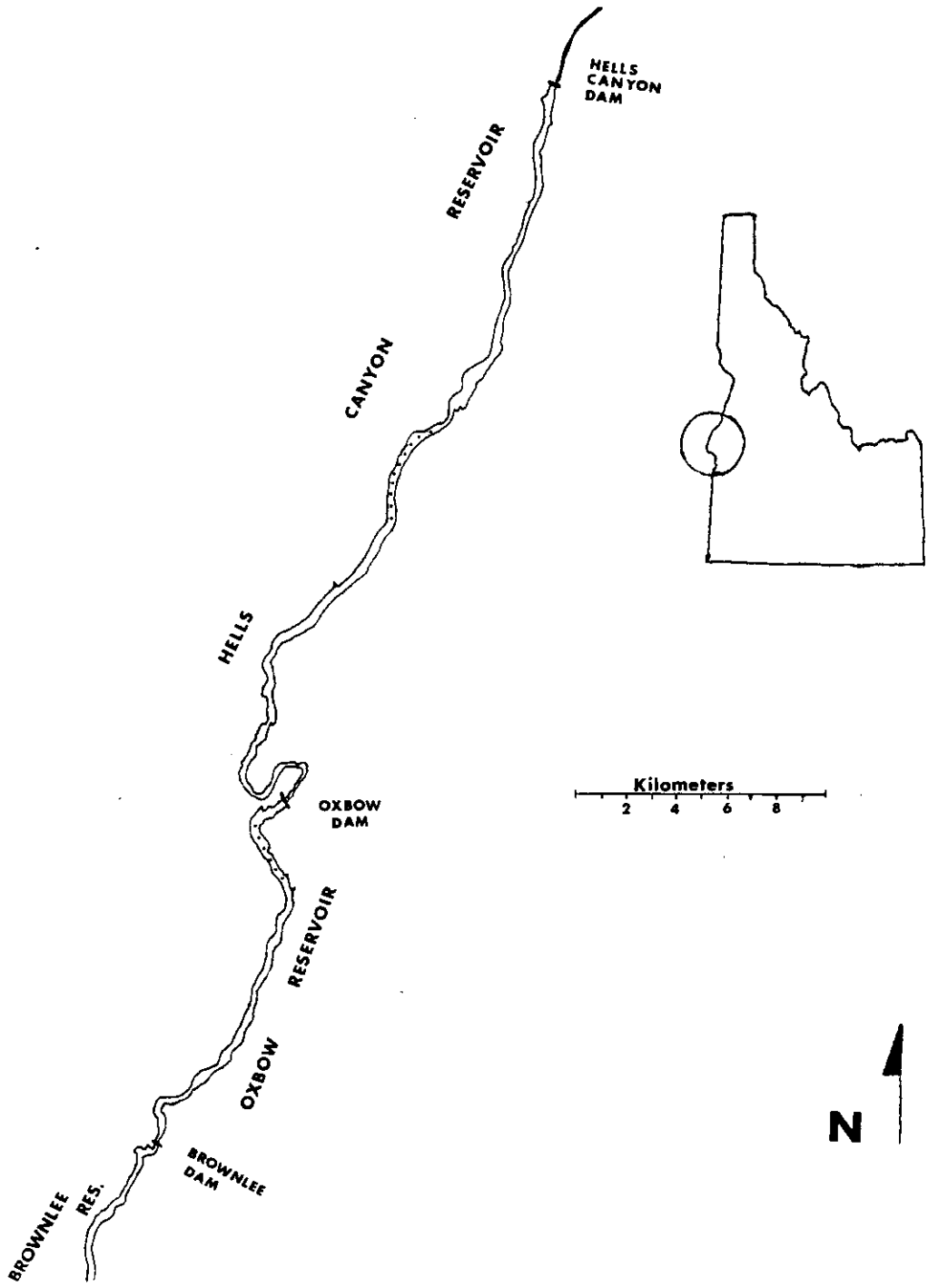

Figure 15. Oxbow and Hells Canyon reservoirs on the Snake River between Idaho and Oregon.

2. Direct efforts in 1987 and 1988 toward evaluating population changes in smallmouth bass as effected by the 12-inch minimum size limit.

3. Continue to stock 50,000 fingerling rainbow trout annually in Horsethief Reservoir.

4. Use domestic Kamloops or Mt. Lassen stocks to obtain maximum first-season growth.

TECHNIQUES USED

Oxbow-Hells Canyon Reservoir Complex

McCall fisheries personnel made spring (May 6-8) and fall (September 24-26) trips to the Oxbow-Hells Canyon Reservoir complex in 1986.

We electrofished along the shore in water less than two meters deep at night with a 2000 watt Coffelt VVP-2C unit for one hour in each reservoir during May. No electrofishing was done in September due to persistent rains. Four monofilament experimental gill nets with stretched meshes ranging from one to five inches, increasing at one-half inch intervals, were set for one night in each reservoir in both May and September.

We traveled the entire length of both reservoirs and interviewed anglers to determine their catch rate and the species composition of their catch.

We compared catches from the surface and bottom set gill nets in September. There were more than twice as many fish in bottom than in surface nets, and almost all bass were caught in bottom nets.

Horsethief Reservoir Opening Weekend Creel Survey

Idaho Department of Fish and Game personnel conducted angler counts spaced at two-hour intervals from 0730 to 1930 and counted bank, boat and float tube anglers. Binoculars and a spotting scope were used to make counts from three locations around the lake. Anglers were interviewed between counts to record the hours they fished and the numbers of fish caught. Species composition and the size of fish caught also were recorded.

Total daily use was calculated from the following formula:

$$TU = A \times DH$$

Where: TU = total use
A - average angler use per count
DH = daylight hours

In 1984 two different stocks of trout, domestic kamloops and Mt. Lassen rainbow, were marked using colors grit. Percent of each marked group that returned to the creel in 1985 and 1986 and their growth and condition (K) were calculated from harvest and length/weight information. Percent mark retention was determined by hatchery personnel in 1984 and 1985 (Table 15).

Three different stocks of rainbow trout, i.e. Shasta, Mt. Lassen and McConaughy, were planted in 1985 to further evaluate the success of various trout strains in Horsethief Reservoir. This year's harvest data is used to evaluate the results of those plantings.

FINDINGS

Oxbow-Hells Canyon Reservoir Complex

The species captured most frequently with electrofishing was smallmouth bass, followed by suckers (bridge lip and large scale) in Hells Canyon Reservoir and bridge lip suckers and rainbow trout in Oxbow Reservoir (Fig. 16). Fifty-three percent and seventy-three percent of the electrofishing catch were game fish from Hells Canyon and Oxbow reservoirs, respectively (Table 16).

The proportional stock density (Anderson 1978) for smallmouth bass in the spring electrofishing samples were 20% for Oxbow and 50% for Hells Canyon reservoirs, based on sample sizes of 10 and 2 respectively and stock size of 18 cm and quality size of 28 cm (Nielson and Johnson, ed, 1983).

Less than 1% of the spring gill net catch from Hells Canyon Reservoir and none of the catch from Oxbow Reservoir were smallmouth bass (Fig. 17), a strong contrast with electrofishing. The predominate species in gill net catches from both reservoirs was the chiselmouth chub. This species and common carp comprised 742 of the gill net catch in Hells Canyon Reservoir. The second most abundant species in the Oxbow Reservoir gill net catch was channel catfish (16% of the catch), closely followed by northern squawfish and black crappie. Fifteen and thirty-three percent of the gill net catches were game fish from Hells Canyon and Oxbow reservoirs, respectively.

Considering electrofishing and gill net data together, there were 15 species (9 game fish species) captured in Hells Canyon Reservoir and 12 species (6 game species) in Oxbow Reservoir. Electrofishing is much more selective for bass and less selective for channel catfish than are gill nets.

Angler catch rates on Oxbow and Hells Canyon reservoirs were 0.8 and 0.2 fish per hour, respectively (Table 17). Three species, black crappie, rainbow trout and channel catfish, were in the Oxbow Reservoir catch, and four species, black crappie, rainbow trout coho salmon and smallmouth bass, were in the Hells Canyon Reservoir catch (Figs. 18 and

Table 15. Stocking record, size of fish planted, and percent mark retention of differentially marked rainbow trout strains stocked in Horsethief Reservoir in 1984, 1985 and 1986. Also, presented are 1985 and 1986 percent harvest of marked fish, including growth and condition factor (K).

Date planted	Stock	Number planted	Lbs. of fish planted	Fish/lb.	Mark color	% Mark retention	Percent of harvest		Average Ln. (mm)		Average Wt. (g)		Average K	
							1985	1986	1985	1986	1985	1986	1985	1986
5/17,18/84	Catchable Rainbow (R1)	14,400	6,000	2.4	Fin erosion	100.0*	1.0	--	372.5	--	506.7	--	0.98	--
7/18,26/84	Domestic Kamloops (K)	23,205	1,350	17.2	Red	64.7	18.9	5.7	274.3	358	214.3	477	1.04	1.04
7/18/84	Mt. Lassen (R4)	28,120	1,900	14.8	Green	2.9	17.2	2.5	276.9	360	228.4	477	1.08	1.02
1984	R4 and K1 No mark	Included above					63.0	13.6	279.4	359	235.5	461	1.08	1.00
7/1/85	Shasta (R5)	15,040	235	64.0	Red	86.1	--	24.4	--	281	--	204	--	0.92
7/1/85	Mt. Lassen (R4)	15,180	230	66.0	Yellow	90.3	--	9.3	--	285	--	199	--	0.86
7/1/85	McConaughy (R6)	14,900	100	149.0	Lt. green	86.4	--	--	--	--	--	--	--	--
8/16/85	Henrys Lake Cutthroat	25,720	59.4	433.0	Fin erosion	100.0	--	--	--	--	--	--	--	
1985	R4, R5, R6 no mark	Included above	--	--	--	--	43.0	--	282	--	211	--	0.94	
	Brook trout		--	--	--	--	1.4	--	248	--	148	--	0.97	
5/28/86	Mt. Lassen (R4)	21,250	1,700	12.5	--	--	--	--	--	--	--	--	--	--
5/29/86	Mt. Lassen (R4)	20,000	1,600	12.5	--	--	--	--	--	--	--	--	--	--
7/8/86	Rainbow Unspecified	10,500	500	21.0	--	--	--	--	--	--	--	--	--	--
8/12/86	Henrys Lake Cutthroat	25,000	69	362	--	--	--	--	--	--	--	--	--	--

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BA - Smallmouth Bass
BS - Bridgelip Sucker
LS - Largescale Sucker
BC - Black Crappie
CM - Chiselmouth
YP - Yellow Perch
CP - Carp
WC - White Crappie
NF - Northern Squawfish
RW - Rainbow (Wild)
RH - Rainbow (Hatchery)
S - Sculpin
BG - Bluegill

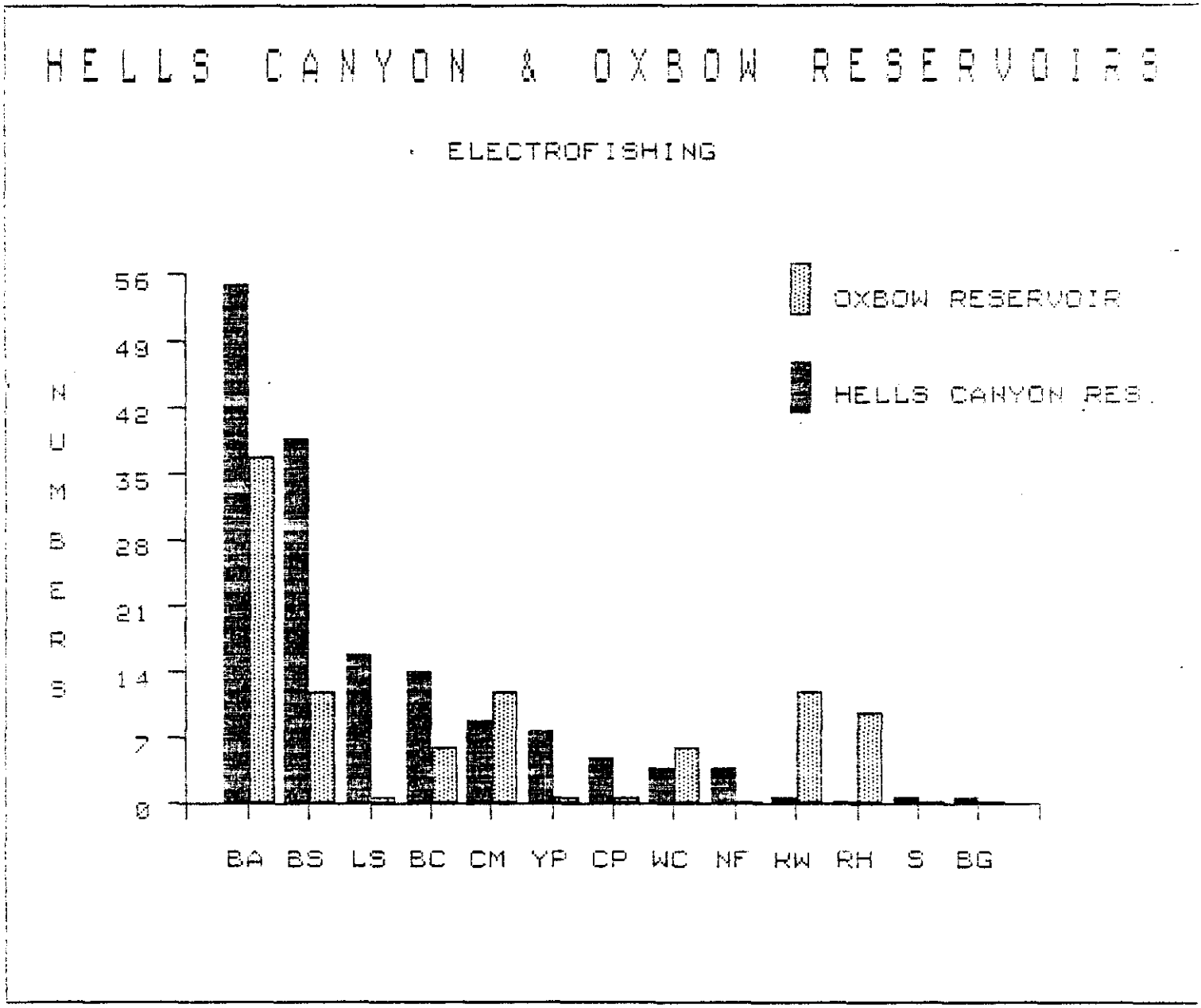

Figure 16. Relative species composition in the electrofishing catch at Hells Canyon and Oxbow reservoirs, May 1986.

Table 16. Hells Canyon and Oxbow reservoirs May 1986 electrofishing and gillnetting results.

Species	Electrofishing		Gillnetting		Total
	Hells Canyon	Oxbow	Hells Canyon	Oxbow	
Smallmouth Bass	55	37	0	1	93
Bridgelip Sucker	39	12	7	30	88
Largescale Sucker	16	1	15	9	41
Black Crappie	14	6	12	35	67
Chiselmouth	9	12	101	120	242
Yellow Perch	8	1	1	2	12
Carp	5	1	93	10	109
White Crappie	4	6	0	6	16
Northern Squawfish	4	0	6	40	50
Rainbow (wild)	1	12	15	3	31
Rainbow (hatchery)	0	10	0	6	16
Sculpin	1	0	0	0	1
Bluegill	1	0	0	0	1
Channel Cat	0	0	10	50	60
Whitefish	0	0	1	0	1
Coho	0	0	1	0	1
Total	157	98	262	312	829

BA - Smallmouth Bass
BS - Bridgelip Sucker
LS - Largescale Sucker
BC - Black Crappie
CM - Chiselmouth
YP - Yellow Perch
CP - Carp
WC - White Crappie
NF - Northern Squawfish
RW - Rainbow (Wild)
RH - Rainbow (Hatchery)
CC - Channel Cat
WF - Whitefish
CO - Coho

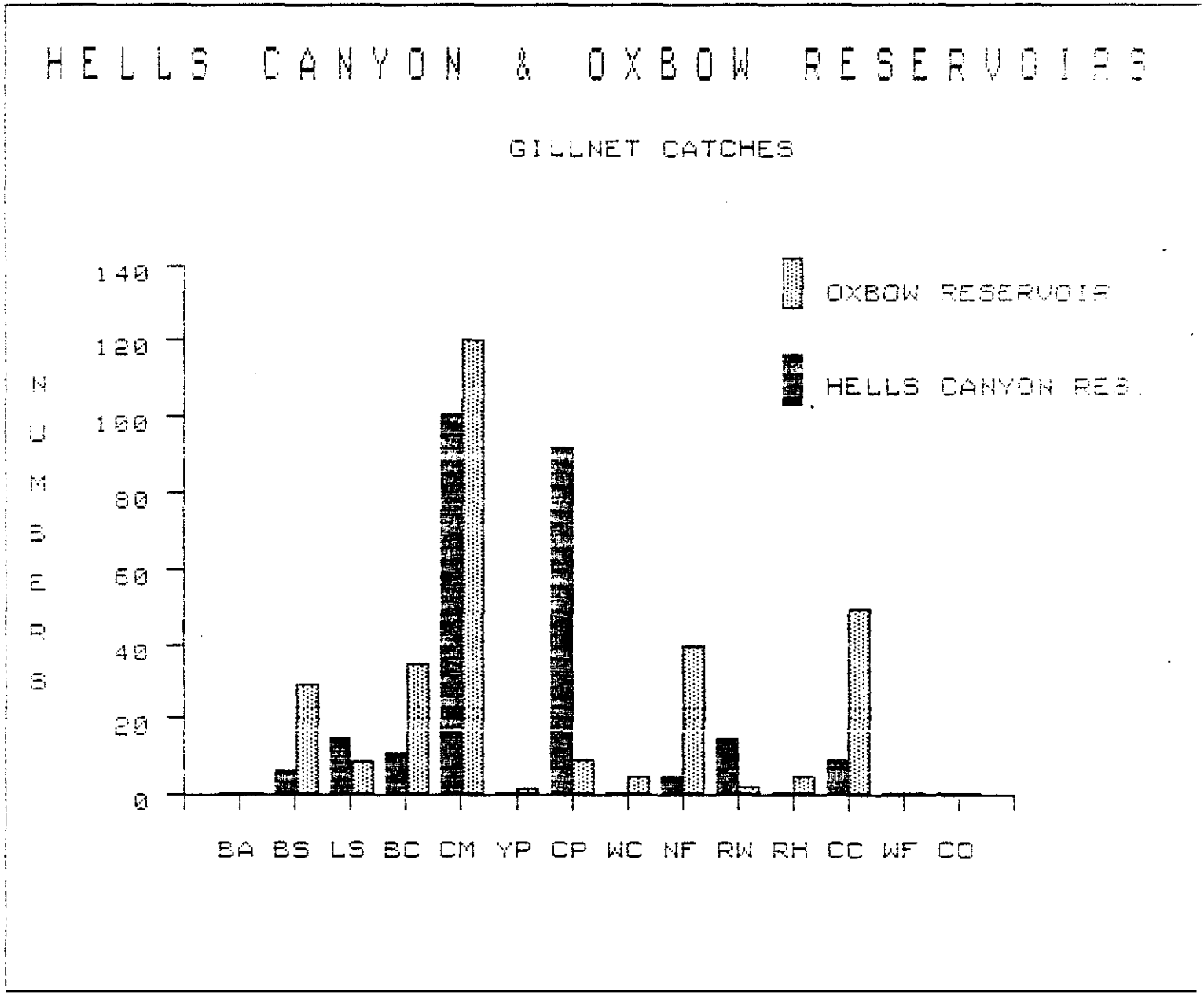

Figure 17. Relative species composition in gill net catches at Hells **Canyon and Oxbow reservoirs, May 1986.**

Table 17. Creel survey results for **Oxbow and Hells Canyon reservoirs, May 1986.**

Number of anglers	Hours fished	Number harvested: Black crappie	Rainbow trout	Channel catfish	Smallmouth bass	Coho salmon
Oxbow Reservoir						
1	3	1	4	0	0	0
1	1	4	0	0	0	0
1	4.5	1	1	0	0	0
3	6	0	0	0	0	0
2	2	5	0	0	0	0
2	2	3	0	0	0	0
4	6	1	0	1	0	0
1	1.5	No catch				
Total	26.0	15	5	1	0	0
Fish per hour = 21/26 = 0.81						
Hells Canyon Reservoir						
2	10	0	1	0	0	0
3	36	No catch				
2	4	0	0	0	1	0
2	1	No catch				
2	8	No catch				
2	3	14	0	0	0	0
4	12	0	4	0	0	1
4	12	No catch				
2	1	No catch				
Total	87	14	5	0	1	1
Fish per hour = 21/87 = 0.24						

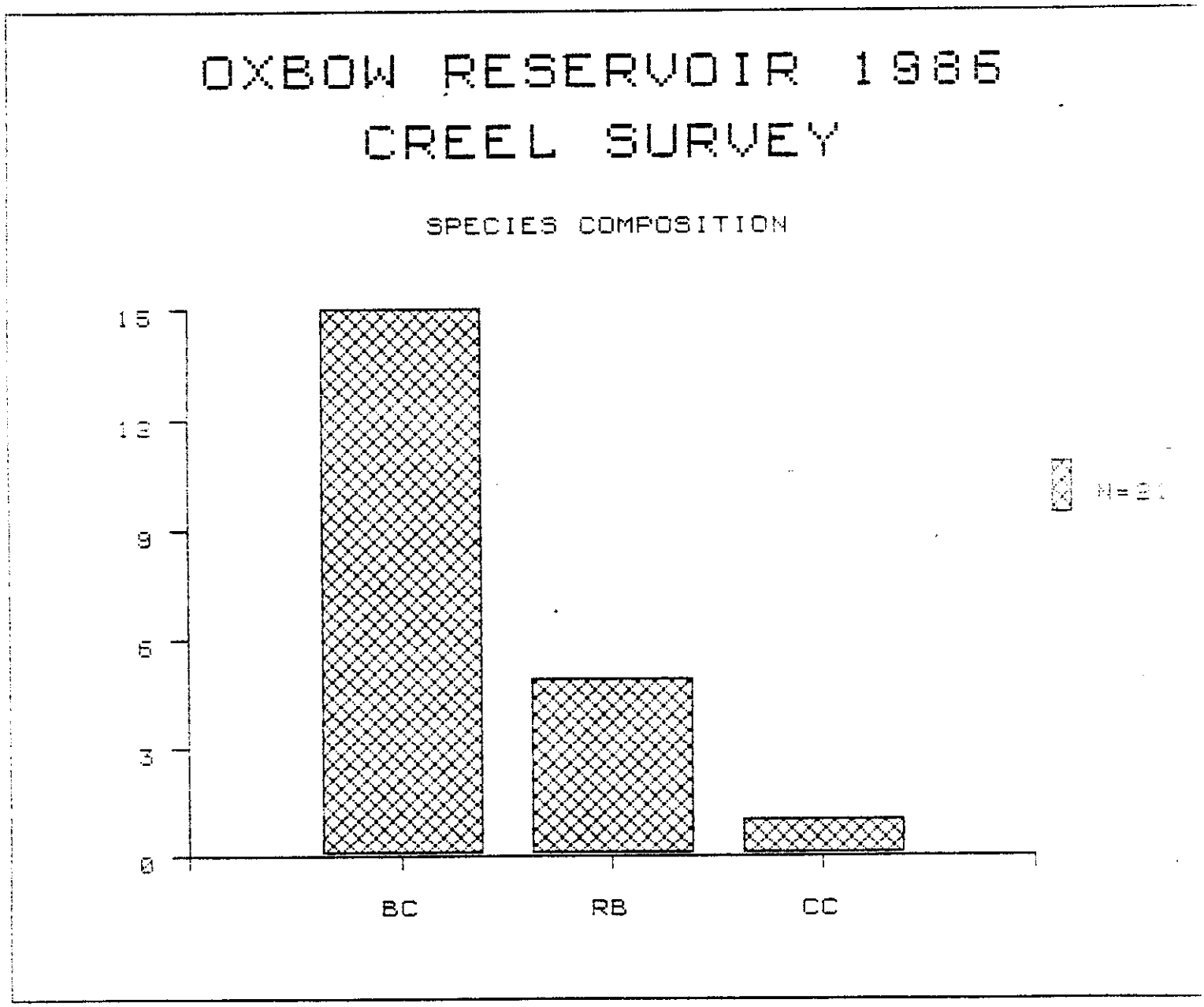

Figure 18. Relative species composition of fish in the harvest at Oxbow Reservoir, May 1986.

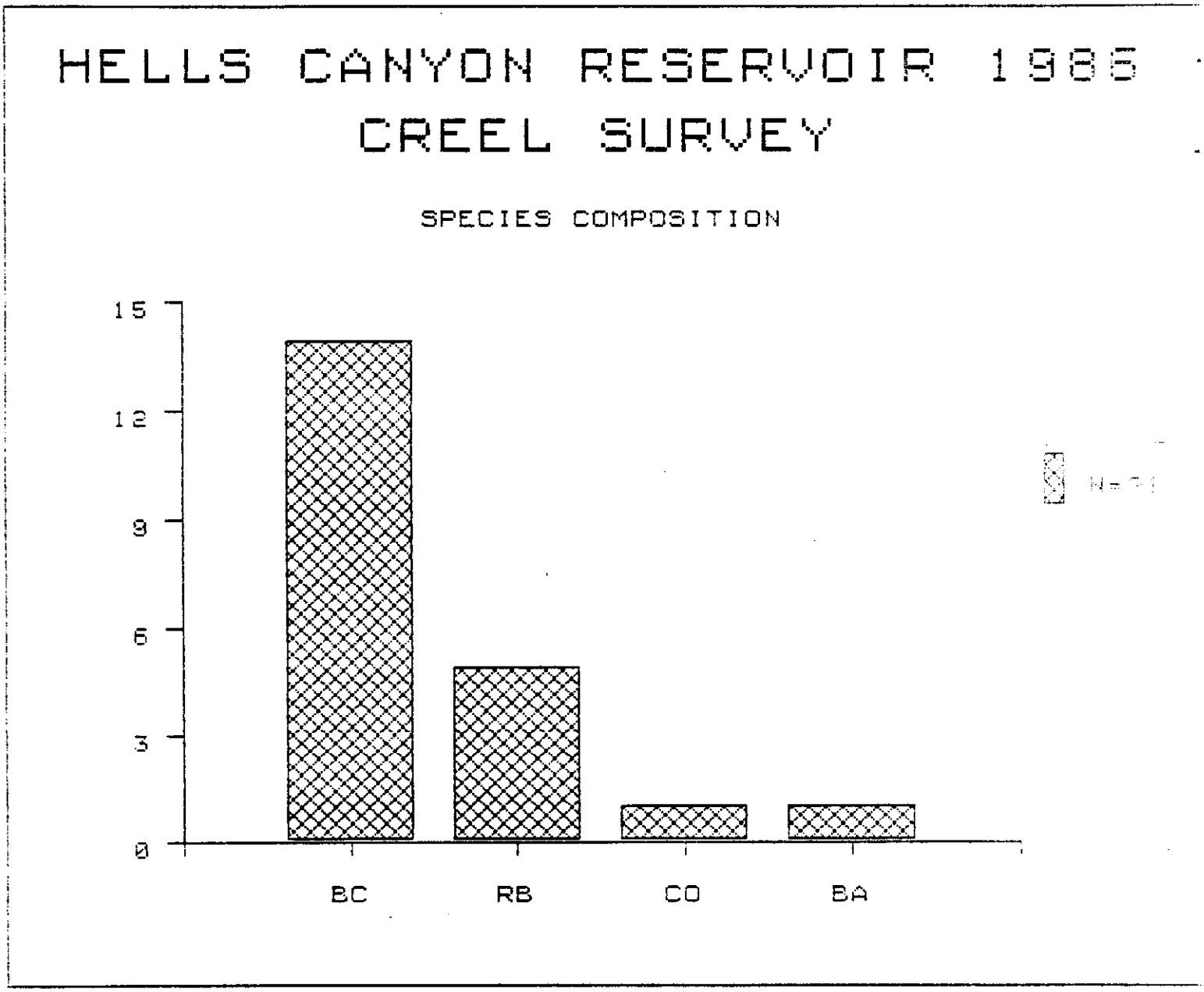

Figure 19. Relative species composition of fish in the harvest at Hells Canyon Reservoir, May 1986.

19). Anglers did not indicate that they had caught nongame fish. Data was from 26 and 97 hours of fishing effort on Oxbow and Hells Canyon reservoirs, respectively.

Fall Survey

We were unable to electrofish during the fall survey due to persistent rain. Gill nets captured 12 species each in Oxbow and Hells Canyon reservoirs (Table 18). One species caught in Hells Canyon Reservoir and not seen in the May catch was brown bullhead. The most abundant species in both the fall and spring was the chiselmouth chub. Carp were again more common in Hells Canyon than Oxbow Reservoir. However, channel catfish were found to be more abundant in Hells Canyon Reservoir than appeared in the spring catch. Smallmouth bass were well represented in the fall gill net catches of both reservoirs in contrast to gill net catches in May.

Proportional stock densities for smallmouth bass from fall gill net catches were 69% in Oxbow Reservoir and 41% for Hells Canyon Reservoir; both values indicate quality bass populations (Anderson 1978). Sample sizes were 29 and 17 bass from Oxbow and Hells Canyon reservoirs, respectively. All bass caught in Oxbow Reservoir were at least stock size, as were 85% of those from Hells Canyon Reservoir, a strong contrast to the spring electrofishing catches of 27% stock size (n - 27) and 4% stock size (n = 55) at Oxbow and Hells Canyon reservoirs, respectively.

We interviewed 11 anglers on Hells Canyon Reservoir and 10 on Oxbow Reservoir during September. Respective catch rates were 2.6 and 1.2 fish per hour, much better than during the May survey. Species compositions were 92% crappie, 3% catfish and 2% trout at Hells Canyon Reservoir and 61% crappie, 35% trout and 4% catfish at Oxbow Reservoir. Trout fishing appears better at Oxbow Reservoir because a significant percent of anglers fish at the mouth of Wildhorse Creek, an area where trout appear to concentrate.

Horsethief Reservoir Opening Weekend Creel Survey

During the opening weekend of trout season at Horsethief Reservoir in 1986 (May 24-25), angler use increased 28% while harvest decreased 30% over the opening weekend in 1985 (Table 19). Average catch rates of 0.79 fish per hour was 45% lower than the 1985 catch rate of 1.45 trout per hour. Boat anglers experienced the highest catch rates (0.90 trout per hour), while bank and tube anglers had catch rates of 0.78 and 0.50, respectively.

Approximately 66% of the opening weekend use and 82% of the catch occurred on the opening day. The average length of rainbow trout in 1986 was 294 mm compared to 277 mm in 1985.

Table 18. Catches from surface and bottom set gill nets in Hells Canyon and Oxbow reservoirs, September 1986.

	Hells Canyon			Oxbow		
	Surface	Bottom	Total	Surface	Bottom	Total
Smallmouth bass	2	18	20	0	30	30
Bridgelip suckers	6	0	6	1	17	18
Largescale sucker	1	14	15	0	10	10
Black crappie	2	20	22	1	13	14
Chiselmouth	23	18	41	67	73	140
Yellow perch	0	10	10	1	2	3
Common carp	20	16	36	0	1	1
White crappie	0	0	0	0	3	3
Squawfish	20	9	29	27	29	56
Rainbow trout (wild)	1	0	1	0	0	0
Rainbow trout (hatchery)	0	0	0	1	0	1
Bluegill	0	0	0	0	2	2
Channel catfish	6	28	34	2	18	20
Whitefish	1	0	1	0	0	0
Bullhead	1	0	1	0	0	0
Total	83	133	216	100	198	298

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Table 19. Opening weekend angler use and harvest data, 1974-1986, for Horsethief Reservoir.

Year	Fishing hours	Brook trout	Cutthroat and hybrids	Rainbow trout	Total trout	Trout per hour				Perch	Perch/ hour
						Boat	Bank	Tube	Combined		
1974	12,134	0	0	7,444	7,444	--	--	--	0.61	--	--
1975	7,786	8	0	3,137	3,145	--	--	--	0.40	--	--
1976	12,345	224	149	9,944	10,342	--	--	--	0.84	--	--
1977	7,443	51	148	4,620	4,744	--	--	--	0.64	--	--
1978	8,874	18	27	3,040	3,067	--	--	--	0.34	--	--
1979	5,876	197	329	1,909	2,435	0.21	0.48	1.53	0.41	--	--
1980	3,167	12	0	6,032	6,044	2.60	0.98	5.13	1.91	--	--
1981	362	--	--	--	376	--	--	--	1.04	--	--
1982	8,688	167	142	4,759	5,058	0.77	0.52	1.17	0.62	455	0.05
1983	4,685	89	25	2,153	2,267	0.53	0.52	0.31	0.48	1,546	0.33
1984	3,477	1	0	1,379	1,380	0.87	0.12	0.68	0.40	--	--
1985	6,205	0	0	8,982	8,982	1.7	1.33	1.57	1.45	--	--
1986	7,940	1	0	6,271	6,272	0.90	0.78	0.50	0.79	--	--

Marked fingerling trout (Kamloops and Mt. Lassen) stocked in July 1984 supported an excellent weekend of fishing in 1985 and also provided 8.2% of the catch in 1986 (Table 15).

Shasta and Mt. Lassen trout strains stocked in equal numbers in 1985 composed 24Z and 9Z, respectively, of the 1986 opening weekend harvest.

The average condition factor (K) of the two strains was similar, i.e., Shasta was 0.92 and Mt. Lassen was 0.86.

Percent grit mark retention, which was monitored by Mackay Hatchery in 1984, showed Kamloops as having a much higher mark retention than Mt. Lassen. However, the numbers of Mt. Lassen stock carrying the green grit mark and reported in the creel suggest that the percent mark retention was higher than the reported 2.9%. Shasta, Mt. Lassen and McConaughy strains stocked in 1985 which did not retain the differential grit mark comprised 43Z of the harvest in 1986. The light green grit marks of the McConaughy stock planted in July 1985 did not show up in the creel data for 1986. However, these fish were identified during the same month by gill net sampling by Idaho Department of Fish and Game personnel. Of the 154 rainbow caught, 56Z did not show any of the grit marks. Of the 68 marked fish, 15 (22Z) were red (Shasta), 32 (47%) were yellow (Mt. Lassen) and 21 (31%) were green (McConaughy). Differences in observed percent grit marks between creel and gill netting data could be attributed to the method by which the grit marking was read, such as the use of a black light or to the experience of the observers.

Two different stocks of rainbow trout fingerlings were planted in Horsethief Reservoir in 1986 along with Henrys Lake cutthroat trout. Number and size of fish stocked are reported in Table 15. The 1986 plantings had no identifying grit markings.

DISCUSSION

Oxbow-Hells Canyon Reservoir Complex

Numerous fish species occur in Oxbow and Hells Canyon reservoirs, a significant portion of which are game fish. Gill net catches probably represent most species present in the reservoirs, but considerable contradiction in relative species abundance and catch rate is seen from season to season and from one sampling technique to another. Sandow (1970) sampled a 90 acre Georgia reservoir with gill nets, creel surveys and cove rotenone, then removed all fish after a complete rotenone treatment. He found that gill nets sampled all species, but that none of the sampling methods gave a close approximation of relative species abundance.

There appears to be an abundance of both smallmouth bass and forage species. Spring electrofishing indicated a large percentage of small bass in the species composition. Forage fish caught were generally too large for these bass. Crayfish, which are abundant in both reservoirs, may be the main food for smallmouth bass. If the 12-inch minimum size limit on bass results in an increased number of larger bass in these

reservoirs, the bass may become more effective predators on forage species, ultimately stimulating increased production of forage species, providing more small forage fish for young bass.

At present, Oxbow and Hells Canyon reservoirs are providing good fishing for a mixed creel of warmwater and coldwater species. Most fishing effort we observed was from bank anglers seeking crappie, catfish and trout.

Horsethief Reservoir Opening Weekend Creel Survey

All evaluated rainbow trout stocks provided acceptable rates of return to the creel in Horsethief Reservoir. Availability and hatchery scheduling may be the major considerations in future fingerling stocking. The more domesticated strains such as Kamloops or Mt. Lassen stocks exhibited slightly greater first-year growth. They also appeared more catchable than the McConaughy stock. Previous surveys revealed a perception by the anglers that the Kamloops stock would readily "take a fly" (Anderson, pers. comm.).

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State of: Idaho

Project No.: F-71-R-11

Job No.: 3(MC)-c

Name: REGIONAL FISHERY MANAGEMENT INVESTIGATIONS

Title: McCall Subregion River and Stream Investigations

Period Covered: July 1, 1986 to June 30, 1987

ABSTRACT

The fishery in the Cabarton Reach of the North Fork Payette River was thought to have special characteristics which would warrent quality trout regulations. The fishery was evaluated as to catch rate, fishing intensity, percent of population that was wild rainbow trout, size structure of the wild rainbow trout population, distribution of trout inhabiting the Cabarton Reach, rate of exploitation and growth rate. Catch rate was variable, in large part dependent on the discharge regime of Cascade Reservoir. High water, which generally occurred most of the summer (irrigation season), resulted in reduced catch rate and corresponding reduced fishing effort. Most rainbow trout in the Cabarton Reach were wild. There was good recruitment of yearling trout, and a significant part of the catch was quality-size, i.e., 35 to 45 cm long. There was no evidence, based on tag returns, that Cabarton trout move outside that river reach. Rate of exploitation was estimated to be 0.29, much lower than in the river section between Cascade Reservoir and the Cabarton Bridge. Rainbow trout in the Cabarton Reach grew to near 42 cm by age four. Although the Cabarton rainbow trout population certainly warrants special protection, the discharge regimes and difficult access results in low exploitation of these fish. Heaviest harvest probably occurs in early spring prior to the runoff and irrigation seasons. A change from year-round fishing to general season should be the first step toward limiting harvest, when necessary.

Twenty transects of the South Fork Salmon River and tributaries and 11 transects of the Middle Fork Salmon River tributaries were snorkel surveyed in July and August 1986 to estimate juvenile salmonid densities. This project, carried out in anadromous fish waters of the McCall Subregion, is part of a statewide evaluation of anadromous fish rearing habitat. Transects were selected in 1984 and 1985, and annual snorkel monitoring was begun. These sites will be monitored for several years to document changes in juvenile fish densities in response to state, federal and international programs designed to improve conditions for anadromous fish stocks. Density of both juvenile chinook salmon and steelhead trout appears to have increased in 1986.

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INTRODUCTION

Rainbow Trout Fishery in the Cabarton Reach of the North Fork Payette River, 1986

The Cabarton Reach of the North Fork of the Payette River (NFPR) begins seven miles south of the town of Cascade at Cabarton Bridge and ends six miles downriver at its passage under Idaho Highway 55, north of Smiths Ferry. This river stretch runs through a heavily forested wild canyon, contains several Class 3 rapids, and is one of the few free-flowing stretches of the NFPR that has not been paralleled by a highway (Fig. 20). The National Park Service has listed this river reach as a potential study river for inclusion in the National Wild and Scenic River system. This river reach also was jointly designated by the U.S. Fish and Wildlife Service, the Environmental Protection Agency and the Idaho Department of Fish and Game as a "highest-valued fishery resource" (McLaughlin and Feldman, 1983).

The river below the Cabarton Reach runs parallel to Highway 55 and is very steep with many Class 5 rapids, while the 10 mile river section between Cascade and the Cabarton Bridge is flat, with a sand and gravel bed in most areas. In contrast, the Cabarton reach has an intermediate gradient, and benefits from the shading provided by steep banks. Additionally, the river benefits from the nutrient-enriched water released from Cascade Reservoir. Access to the Cabarton reach is limited to foot traffic adjacent to the Union Pacific railroad track which parallels the NFPR, rubber rafts, kayaks and at intermediate flows, river dorys. Because of the special characteristics of the Cabarton reach and reports from anglers, it has been thought to possess a quality population of wild rainbow trout.

Snorkel Monitoring of Juvenile Salmonid Densities

This project, carried out in anadromous fish waters of the Idaho Department of Fish and Game's McCall Subregion, is part of a statewide evaluation of anadromous fish rearing habitat. Annual monitoring of juvenile salmonid density in fixed stream sections will provide density trends in response to changes in adult survival and/or habitat quality. Projects are underway to improve both these parameters, and presmolt density monitoring is a means of evaluating these projects' results.

OBJECTIVES

1. To evaluate the Cabarton fishery for quality trout management.

2. To determine if an exceptional trout population exists in the Cabarton Reach of the North Fork of the Payette River which should be protected from excessive harvest.

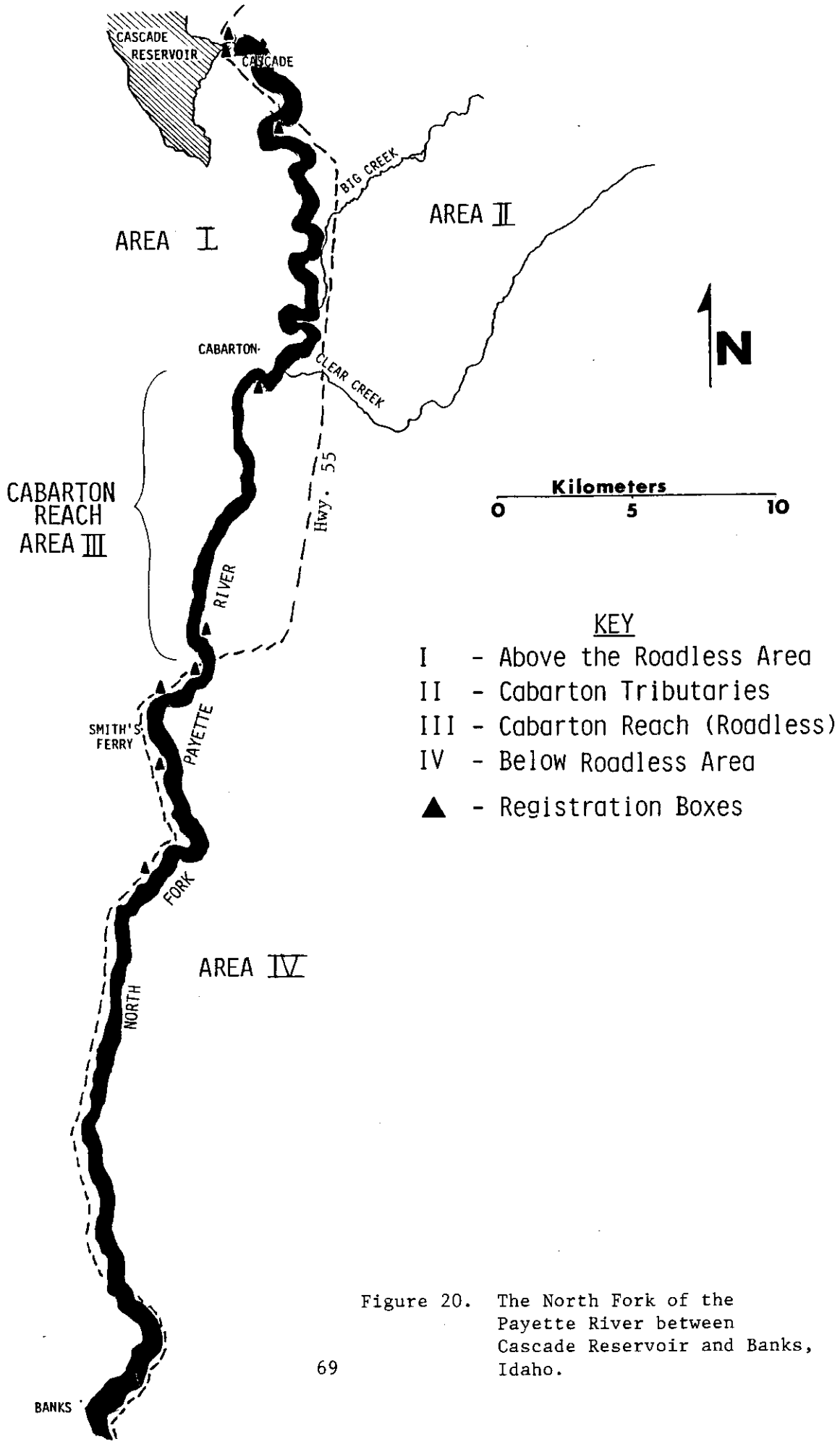

Figure 20. The North Fork of the Payette River between Cascade Reservoir and Banks, Idaho.

3. To determine if the existing trout population in the Cabarton Reach would benefit in terms of numbers and age structure from quality trout management.

4. To determine if the trout population of the Cabarton reach is isolated geographically or if the fish migrate out of the reach into more accessible areas.

5. To determine where rainbow trout in the Cabarton Reach spawn.

6. To monitor annual juvenile salmonid densities in fixed stream sections within the McCall Subregion to provide trend information for evaluating changes in adult survival and habitat quality.

RECOMMENDATIONS

1. Continue present management scenario of year-long season and a bag limit of 6 trout and/or landlocked salmon, combined take only 2 over 16" in the Cabarton Reach of the North Fork Payette River.

2. Monitor changes in angling use patterns, harvest rates and size distribution by repeating incidental angler interviews and rod-and-reel sampling at three-year intervals in the Cabarton Reach.

3. Protect productivity and fishing quality attributes from future land and water developments in the Cabarton Reach.

4. Maintain the option for future quality management to meet the increasing demand for stream fishing opportunity in the Cabarton Reach.

5. Continue annual snorkel monitoring of juvenile anadromous salmonids in established stream sections.

TECHNIQUES USED

We sampled trout in the North Fork Payette River (NFPR) between Cascade Dam and Cabarton Bridge (Area 1), in tributaries entering the studied river sections (Area 2), in the roadless Cabarton Reach between the Cabarton and Rainbow Bridges (Area 3) and downstream from the Rainbow Bridge to highway mile marker 85, south of Smiths Ferry (Area 4). We sampled trout with rod and reel and both battery- and generator-powered electrofishing units. In Clear Creek, the tributary which appeared to have the most spawning potential, we established a picket weir during the spawning season to sample migrating trout. Captured rainbow trout were identified as to either hatchery or wild origin, anesthetized with MS-222, then measured and tagged if 250 mm or longer. Scale samples were removed before the fish were released. Four colors of plastic floy tags were used, one for each area. Returned tags were intended to show fish movement patterns and rates of exploitation. Scales were used to determine age, growth and mortality rates.

Incidental creel survey information was obtained from anglers observed during sampling trips to determine catch rates and size distribution in the sport catch. Angler registration boxes were established at each end of the Cabarton Reach as well as at sites above and below each of the communities of Cascade and Smiths Ferry to obtain further information on catch rates and angler intensity.

In 1986, Department personnel snorkel counted juvenile salmonids in 34 stream transects of the McCall Subregion from July 22 to August 15. Twenty transects were in the South Fork Salmon River (SFSR) and Johnson Creek, Lick Creek and East Fork of the SFSR, tributaries to the SFSR; eight were in Big Creek, Marble Creek and Monumental Creek, tributaries to the Middle Fork Salmon River; three were in Chamberlain Creek, tributary to the main Salmon River; and three were in Hazard Creek and Rapid River, tributaries to the Little Salmon River (Anderson et al. 1987). Transect lengths were near 100 m or longer.

Persons equipped with wet suits, masks, snorkels, waterproof writing pads and pencils entered the water at the downstream end of each transect and slowly crawled upstream through the transect, while identifying fish to species and counting them. The lower nine transects on the SFSR were deep and swift, thus *they* were snorkeled from the top to the bottom of the transect, as snorkeling upstream was not possible. Individual fish in each age class were counted and recorded separately for chinook salmon, steelhead and cutthroat trout. We recorded lengths for individual bull and brook trout and numbers of small (<10") and large (>10") whitefish.

After the fish were counted, we calculated transect surface area by measuring the transect length and widths at 10-meter intervals along the transect length in all areas except for SFSR transects, where we used average dimensions calculated from 1984 and 1985 data by Thurow (1987). At each point where we measured a width, we recorded the type of habitat which was on each side and in the middle of the stream. Habitat categories were pool, riffle, pocket, run and backwater. Detailed drawings of each transect and documentary photographs were available from previous years for snorkel-transect personnel to use to locate transects. An example drawing and photograph of Big Creek, Section #1, were shown in the McCall Subregion's 1985 annual report (Anderson et al. 1987) as were drawings of all MFSR tributaries, Chamberlain Creek, Hazard Creek and Rapid River transects. South Fork Salmon River transect drawings are in Appendix 1 of the present report.

FINDINGS

Rainbow Trout Fishery in the Cabarton Reach of the North Fork Payette River, 1986

We measured and took scales from 152 rainbow trout from April 8 to July 18, 1986. Eighty-two were tagged and seventy were either too small to tag, observed in anglers' creels, or were wounded either in a fish

trap or by a fishing hook. Most tagged fish (53) were captured in Area 3, the Cabarton Reach, with 12, 14, and 3 trout tagged in Areas 1, 2 and 4, respectively.

We sampled with a battery-powered electrofisher in the tributaries of Clear Creek and Big Creek (Area 2) and used a generator-powered unit in Areas 1 and 3, both during the day and at night. No trout were electrofished in the tributaries, and only four were captured in the river. We believe that low conductivity (20 to 30 ohms/cm) renders electrofishing ineffective for trout in the NFPR system. Fourteen trout were captured in May at the Clear Creek weir, six of which were spawners from 317 and 417 mm long (Table 20). Most of the sampled fish were captured by standard rod-and-reel fishing.

Catch Statistics

We obtained information on catch rate and average length of rainbow trout by three different methods (Table 21). The relative ranking of these two parameters differed by survey method. Lowest catch rate in all three surveys was in Area 1, above the Cabarton reach. Areas 3 and 4 had similar catch rates of about 1.3 trout/hour.

Average size of sampled trout was greatest in Area 1 (340 m) probably because this area is a poor juvenile rearing area, i.e., 18 to 22 cm recruits were not in the catch. Average size of trout was similar between Areas 3 and 4, i.e., 26 to 27 cm. The mean length of creeled trout in Area 3 was larger (33 cm) than in Area 4, possibly because anglers walking into this section were more selective than those fishing along Highway 55.

Most fishing by the public was done within one mile of Cascade Reservoir in Area 1, in the upper and lower one-half mile of Area 3 and throughout Area 4. No fishing effort was observed in Area 2. Angler catches in Areas 3 and 4 were 91% and 97% rainbow trout, with the remainder being mountain whitefish (Table 22). Catch in Area 1, which is greatly affected by fish leaving Cascade Reservoir, is 65% perch, 25% trout and 10% whitefish,

Tagged **Fish**

No tags were returned from fish released in tributary streams or from the river below Rainbow Bridge. I have no explanation for why the exploitation rate is low in tributaries, but with only three fish tagged below Rainbow Bridge, the chance of a tag being returned there was very small.

Eleven percent and twenty-five percent of tags were returned from Areas 3 and 1, respectively (Table 23). Most of the fish tagged in Area 1 were released near the town of Cascade, the area which appears to have the greatest fishing pressure in the study area.

Table 20. Rainbow trout length, direction of movement and whether or not it was tagged at the Clear Creek trap in 1986. Whether or not the fish was recovered from the trap alive and whether it was of hatchery or wild origin is also noted.

Date	Length	Up or Down	Tagged	Mortality	Hatchery or wild
4/29	172	Down	--	--	W
5/01	267	Down	X	--	W
5/02	234	Down	--	X	W
5/02	417	Down	X	--	W
5/02	226	Down	--	X	H
5/03	317	Down	X	--	W
5/03	234	Down	--	X	H
5/03	345	Up	X	--	W
5/12	290	Down	X	--	W
5/13	390	Up	X	--	W
5/14	352	Up	X	--	W
5/14	349	Up	X	--	W
5/14	228	Down	X	--	W
5/16	168	Down	--	X	W
			9		

Table 21. Relative fishing effort, catch rate and mean rainbow trout length obtained by three survey methods.

	IDFG tagging crew	Incidental sportsman interviews	Registration forms
Cascade Dam to Cabarton Bridge (Area 1)			
Hours fished	12	35	30
Trout per hour	0.8	0.3	0.3
Mean trout length	34 cm*	--	--
Cabarton Reach (Area 3)			
Hours fished	72	100	36
Trout per hour	1.2	0.8	1.6
Mean trout length	27 cm	33 cm	--
Rainbow Bridge to Banks (Area 4)			
Hours fished	12	48	46
Trout per hour	0.9	1.8	1.5
Mean trout length	26 cm	27 cm	--

*No juveniles

Table 22. Incidental creel survey statistics from the North Fork Payette River fishery, 1986.

Location	Number anglers	Total hours fished	Fish caught			Catch rate	
			RBT*	MWF*	Perch	Total	RBT
Cascade Dam to Cabarton Bridge	24	34.5	10	4	26	1.16	0.3
Cabarton to Rainbow Bridge	24	99.5	82	8	0	0.90	0.8
Below Rainbow Bridge	17	47.5	84	3	0	1.83	1.8

*RBT=rainbow trout, MWF=mountain whitefish.

Table 23. Rates of exploitation as determined by tag return in two areas of the North Fork Payette River study area.

	Number tagged	Tags returned	Rate of exploitation	Adjusted* rates
Tributaries	14	0	0	--
Cabarton	53	6	0.11	0.29
Cascade to Cabarton	12	3	0.25	0.64
Down from Rainbow Bridge	3	0	--	_-
Total	82			

*Based on assumed return rate of recaptured tags of 39%.

The tagging program was explained to the fishing public by placing signs in sport shops in Cascade and Smiths Ferry as well as at six registration boxes at access points along the river. The news media was not advised of the study since we did not want to artificially increase fishing effort by exposing this area to the general public. No reward was offered for tag returns. In a study of return rate of tags (Weaver and England 1986), the authors found that anglers returned only 39% of recovered reward tags. Assuming that this is a maximum return rate for the North Fork Payette River (NFPR) study, where no reward was offered, adjusted exploitation rates for Areas 1 and 3 would be 0.64 and 0.29, respectively. Area 3 receives trout, coho and perch recruitment from Cascade Reservoir and can probably withstand the higher exploitation rate.

We aged 137 wild rainbow trout mostly from Area 3 and found 26%, 58%, 12% and 4% to be from Age Classes 1+, 2+, 3+ and 4+. Using a catch curve analysis (Everhart et al. 1975) on Age 2+, 3+ and 4+ frequencies, we calculated a force of total mortality of 1.29, and thus an annual survival rate of 0.28. The force of total mortality in Area 3 is attributable to a force of fishing mortality of 0.67 and a force of natural mortality of 0.62. Assuming the same survival rate in Area 3, the force of fishing mortality is 1.15 and that of natural mortality, 0.14. Recruitment from Cascade Reservoir probably alters this latter relationship.

Average sizes of Age 1+, 2+, 3+ and 4+ wild rainbow trout were 210, 292, 353 and 424 mm, respectively (Table 24).

We regressed total length in mm (TL) on anterior scale radius (ASR) for 55 wild rainbow trout, 5 from each 2 cm length interval (where available). The relationship (Fig. 21) is:

$$TL = 8.6 + 4.2\ ASR$$
$$r = 0.78$$

Back-calculated lengths at the time of annuli formation were 180, 251 and 372 mm for Age 1, 2 and 3 fish. Values for Ages 1 and 2 correspond well with those from Table 24. However, the value for Age 3 appears too large; some fish believed to be three year old were probably older, since identification of annuli on scales was more difficult on older fish.

Of the nine returned tags, none were recovered outside the area where they were tagged. Although this is a small sample, we will assume that there is *very* little movement of trout between areas. Areas 2 and 4 receive hatchery catchables and Area 1 receives hatchery catchables which move down from Cascade Reservoir. Hatchery catchables in Area 3 must move in from other river reaches, since this area is not stocked. Samples of rainbow trout from the four areas indicate that there is little movement of hatchery catchables into Area 3, since 98% of trout sampled there were wild compared with 57%, 89% and 83% from Areas 1, 2 and 4, respectively (Table 25). Reid (1980) reported that 56% of 1,400 trout seen in angler's creels in Area 4 and down to the mouth of the NFPR were wild in 1980. The rainbow trout population in Area 3 is

Table 24. Sample size, length, standard deviation of length and growth in mm of wild rainbow trout from ages 1+ to 4+ in the North Fork Payette River below Cascade Dam during spring and early summer, 1986.

Age	Sample size	Mean length	Standard deviation	Growth
1+	35	210	33	82
2+	79	292	41	61
3+	17	353	40	71
4+	6	424	60	--

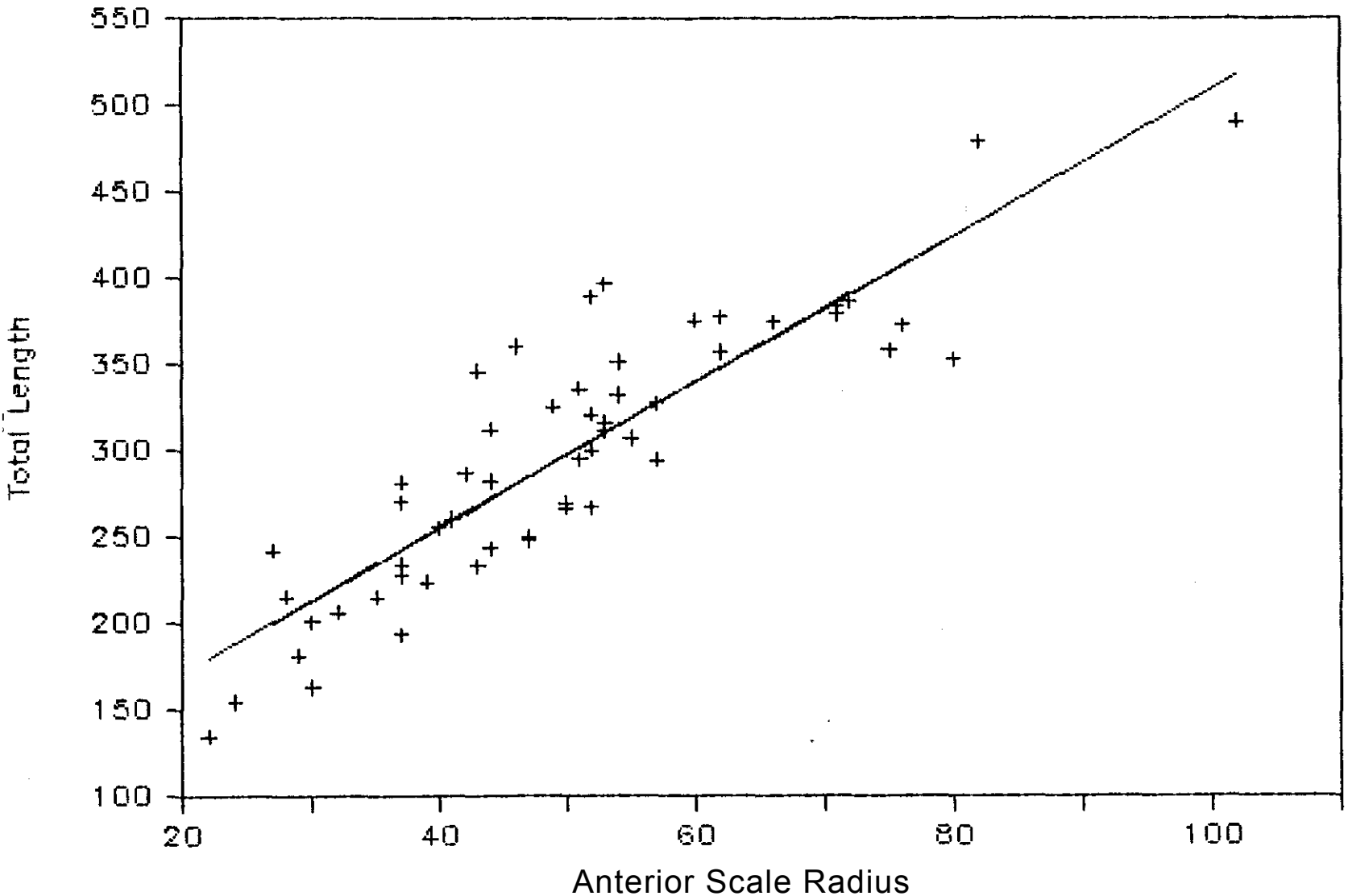

Figure 21. Relationship between total length and anterior scale radius of wild rainbow trout in the North Fork Payette River between Cascade Reservoir and Banks, Idaho.

Table 25. Percent wild rainbow trout observed in the four studied areas of the North Fork Payette River system, **1986.**

Area		% wild	N
1	Cascade to Clear Creek	57	14
2	Tributaries (Big & Clear creeks)	89	19
3	Cabarton Reach	98	127
4	Below Rainbow Bridge	83	12

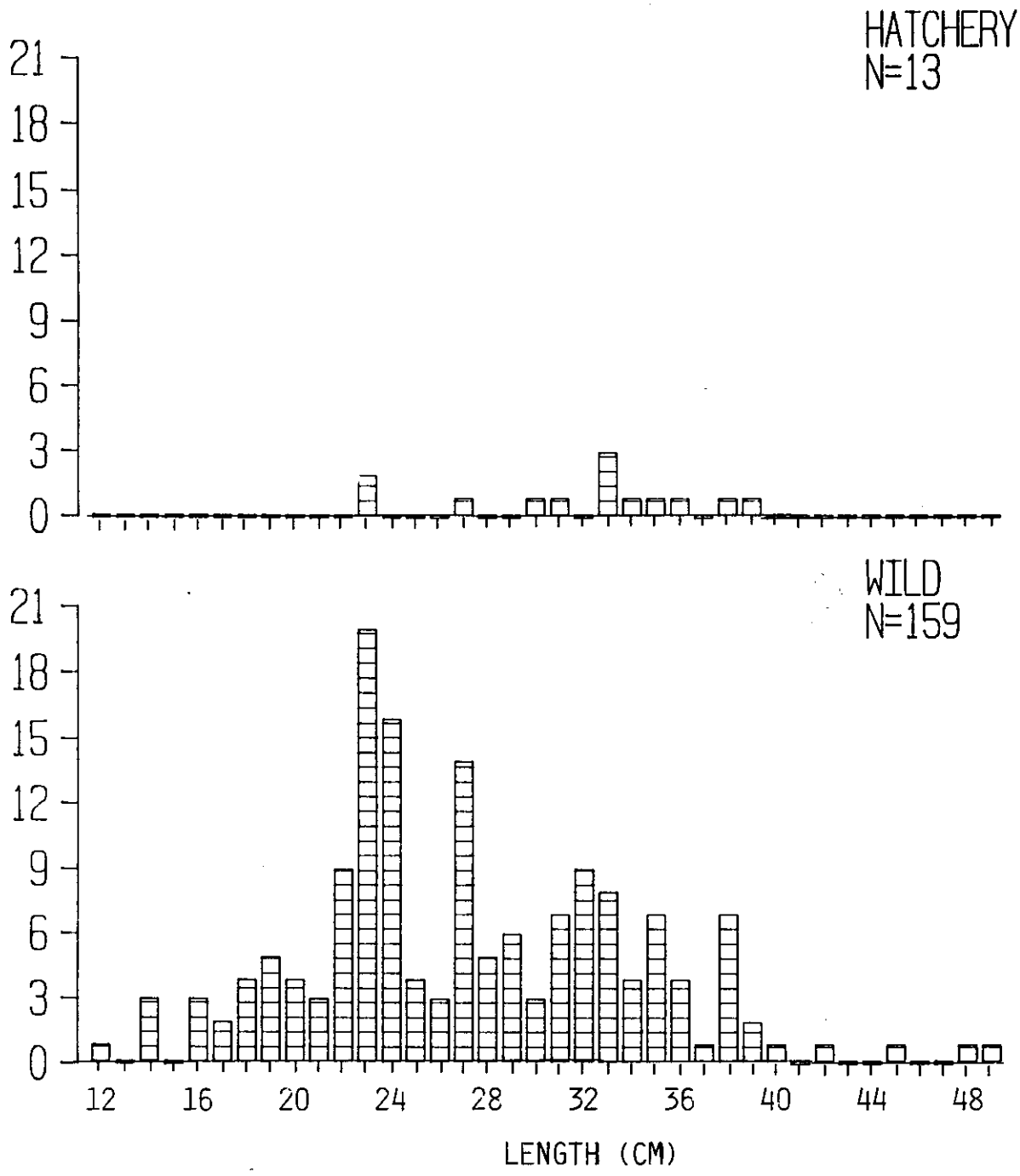

Figure 22. Length frequency distribution of hatchery—reared and wild rainbow trout from the North *Fork* Payette River between Cascade Reservoir and Banks, Idaho.

Table 26. Snorkel transect data from the South Fork Salmon River and tributary streams in 1986.

Date	Transect	Surface area in M^2	Rainbow-steelhead 100/m^2					Cutthroat 100/m^2					Whitefish 100/m^2			Chinook 100/m^2				Bull trout	All species
			3-6	6-9	9-12	12-15	Total	3-6	6-9	9-12	12-15	Total	<10	>10	Total	A-0	A-1	Adult	Total		
7/29	SFSR #18	2926	—	--	—	—	—	—	0.03	—	0.03	0.07	0.3	0.2	0.6	—	—	—	--	—	0.7
7/29	SFSR #19	3288	0.3	2.4	0.5	0.2	3.3	0.06	—	--	—	0.06	0.4	0.7	1.1	1.5	—	—	1.5	0.03	6.0
7/30	SFSR #20	3317	0.2	3.1	0.1	—	3.4	—	—	—	—	—	0.2	0.7	0.9	4.1	0.1	4.1	0.06	8.5	
7/31	SFSR #21	3150	0.2	0.7	—	—	0.9	—	—	—	—	—	0.2	0.4	0.6	0.2	—	—	0.2	—	1.8
7/31	SFSR #22	2172	0.1	0.9	0.1	0.1	1.3	0.1	—	—	—	0.1	1.0	0.6	1.6	0.7	—	—	0.7	—	3.7
8/04	SFSR #24	3398	0.1	0.4	—	—	0.4	—	—	—	0.1	0.1	—	0.3	0.3	0.03	—	—	0.03	—	0.8
8/04	SFSR #25	2929	0.1	3.3	0.2	—	3.5	—	—	0.1	0.03	0.13	0.1	0.6	0.7	0.8	—	—	0.8	—	5.1
8/05	SFSR #26	3117	0.2	2.2	—	—	2.4	—	—	—	—	—	0.2	0.6	0.8	0.9	—	—	0.9	—	4.1
8/06	SFSR #28	2614	—	0.3	0.1	0.04	0.4	—	—	0.1	0.04	0.14	0.2	0.4	0.6	0.1	—	—	0.1	—	1.2
8/14	SFSR #5	481	0.6	0.2	—	—	0.8	—	—	—	—	—	—	—	—	26.0	0.2	—	26.2	—	27.03
8/14	SFSR #7	612	2.5	2.0	0.2	—	4.6	—	—	—	—	—	0.5	1.0	1.5	27.5	—	1.1	28.6	—	34.6
8/14	SFSR #11	1068	0.3	1.2	0.1	—	1.6	—	—	—	—	—	0.5	8.4	8.8	17.7	—	0.3	18.0	—	28.4
8/14	SFSR #14	1861	0.05	--	—	—	0.05	—	—	—	—	—	0.9	14.9	15.8	15.3	—	0.05	15.3	—	31.2
8/14	SFSR #16	2475	0.9	0.8	0.04	—	1.7	—	—	—	—	—	1.3	1.0	2.3	11.8	0.04	—	12.0	—	16.0
8/15	John. #L-2	1720	2.6	0.6	0.1	—	3.3	—	—	—	—	—	0.2	0.3	0.5	7.7	0.8	—	8.5	—	12.21
8/15	John. #L-3	1499	2.2	0.5	—	—	2.7	—	—	—	—	—	—	1.1	1.1	7.6	—	—	7.6	—	11.4
8/15	EFSR #3	218	2.4	2.8	3.8	—	8.9	—	—	—	—	—	—	—	—	8.9	—	—	8.9	—	17.8
8/15	EFSR #6	2267	1.7	0.5	—	—	2.3	—	—	—	—	—	0.1	4.6	4.7	10.3	—	—	10.3	0.04	17.3
8/15	EFSR #7	1209	1.7	1.9	—	—	2.3	—	—	—	—	—	0.3	0.3	0.5	0.2	—	—	0.2	—	4.3
8/15	Lick Cr.	545	8.1	1.5	—	—	9.5	—	—	—	—	—	—	—	—	2.8	0.6	—	3.3	—	12.8

R9R8DJT1

Table 27. Snorkel transact data from the Middle Fork Salmon River and tributaries, Chamberlain Creek end Little Selman River tributaries In 1986.

Date	Transect	Surface area in M^2	Rainbow-Steelhead 100/m^2					Cutthroat 100/m^2				Whitefish 100/m^2			Chinook 100/m^2				Bull trout	Brook trout	All species
			3-6	6-9	9-12	12-15	Total	3-6	6-9	9-12	Total	<10	>10	Total	A-0	A-1	Adult	Total			
8/27	Big-1*	922.0	5.1	1.5	—	—	6.6	0.2	—	—	0.2	—	0.5	0.5	21.0	0.4	—	21.5	0.1	0.8	29.0
7/29	CHA-1	990.0	7.9	0.9	—	—	8.8	0.1	—	—	0.1	1.6	0.2	1.8	34.3	0.1	—	34.4	0.1	—	45.3
7/29	CHA-2	672.0	13.7	2.2	0.3	—	16.2	—	—	—	—	1.5	0.6	2.1	68.2	7.1	0.1	75.4	0.9	—	94.6
7/29	CHA-3	416.0	4.1	1.2	0.2	—	5.5	—	—	—	—	—	—	—	6.5	0.2	—	6.7	0.2	—	12.5
7/30	HAZ-1	1263.6	7.5	4.5	1.5	0.8	13.6	—	0.8	—	0.8	0.8	—	0.8	—	—	—	—	—	—	13.8
7/22	MAR-1	638.67	8.3	3.5	0.6	0.2	12.5	2.8	1.9	0.3	5.0	—	—	—	—	—	—	—	0.2	—	17.7
7/22	MAR-2	528.57	0.4	—	—	—	0.4	0.4	1.0	0.2	1.5	1.0	—	1.0	—	—	—	—	—	—	2.8
7/23	MON-1	598.25	0.2	—	—	—	0.2	1.8	1.0	—	2.84	0.7	—	0.7	—	—	—	—	—	—	3.68
7/25	MON-2	714.57	3.6	1.5	0.7	—	5.9	0.4	0.1	—	0.6	0.1	—	0.1	0.1	0.1	—	0.2	—	—	6.86
7/25	MON-3	590.0	1.2	2.2	0.7	—	4.1	3.9	0.7	—	4.6	0.7	0.2	0.9	0.5	—	—	0.5	—	—	10.2
7/24	MON-4	634.8	1.6	0.5	—	—	2.1	2.1	0.3	—	2.4	—	—	—	15.9	0.5	0.2	16.5	—	—	21.23
7/24	MON-5	1052.4	1.3	1.1	—	—	2.4	1.1	0.3	—	1.4	—	0.6	0.6	29.9	—	0.1	30.0	—	0.1	34.6
7/28	RAP-1	829.9	2.7	0.8	—	—	3.5	—	—	—	—	—	—	—	—	—	—	—	0.2	—	3.7
7/30	RAP-2	1229.6	9.1	5.3	0.9	—	15.3	—	—	—	—	—	—	—	0.9	—	2.0	2.9	0.2	—	18.46

*Transect locations given in Appendix 1.

Table 28. Density comparisons (number/100 m^2) of juvenile steelhead trout (<23 cm) and chinook salmon (<20 cm) and all sizes of cutthroat trout in the South Fork Salmon River drainage for **1984, 1985 and 1986.**

	Steelhead trout			Chinook salmon			Cutthroat trout		
	1984*	1985*	1986	1984	1985	1986	1984	1985	1986
Main stem South Fork Salmon River									
SFSR # 5	1.4	0.8	0.8	13.2	18.5	26.2	0.0	0.0	0.0
7	3.1	0.9	2.7	5.1	1.4	27.5	0.0	0.0	0.0
11	2.5	2.7	1.5	13.5	15.1	17.7	0.0	0.09	0.0
14	0.9	0.1	0.1	7.6	2.5	15.3	0.0	0.0	0.0
16	0.9	0.3	1.7	1.7	2.6	11.9	0.0	0.0	0.0
18	0.03	0.0	0.0	1.5	<0.1	0.0	0.0	0.0	0.07
19	1.9	2.0	2.7	2.2	0.5	1.5	0.0	0.0	0.06
20	0.7	2.5	3.3	2.1	2.1	4.2	0.0	0.0	0.0
21	2.1	1.5	0.9	0.8	0.5	0.2	0.03	0.03	0.0
22	0.8	0.2	1.0	1.2	0.0	0.7	0.24	0.04	0.10
24	0.1	0.2	0.5	0.0	0.0	<0.0	0.0	0.05	0.10
25	1.9	0.6	3.4	0.1	0.2	0.8	0.07	0.06	0.13
26	1.3	2.4	2.4	0.1	0.3	0.9	0.03	0.06	0.0
28	0.3	0.5	0.3	0.3	<0.1	0.1	0.19	0.18	0.14
$\bar{X}$	1.3	1.1	1.5	3.5	3.1	7.7	0.04	0.04	0.04
$S_{\bar{X}}$	0.25	0.26	0.32	1.25	1.58	2.7	0.02	0.02	0.01
East Fork of South Fork Salmon River									
EFSF # 3	4.8	3.7	8.9	0.0	9.2	8.9	No cutthroat data		
6	1.1	0.3	2.3	3.6	2.5	10.3			
	3.2	2.7	3.6	0.7	0.9	0.2			
$\bar{X}$	3.0	2.2	4.9	1.4	4.2	6.5			
$S_{\bar{X}}$	1.05	1.00	2.02	1.12	2.54	3.16			

*Data from 1984 and 1985 from Thurow, 1987.

Table 29. Comparative data of juvenile anadromous salmonid densities in Middle Fork Salmon River, Chamberlain Creek and Little Salmon River tributaries.

	Steelhead density number/100 m^2		Chinook density number/100 m^2	
Section	1985	1986	1985	1986
Big-1	1.7(1.7)	6.6(6.6)	7.7(7.7)	21.5(21.5
CHA-1	6.1	8.8	3.9	34.4
CHA-2	8.8	16.2	44.2	75.4
CHA-3	4.8	5.5	22.4	6.7
Mean & SE	6.6(1.18)	10.17(3.16)	23.5(11.65)	38.83(19.96)
MAR-1	2.7	12.5	--	--
MAR-2	0.8	0.4	--	--
Mean & SE	1.75(0.95)	6.45(6.05)	0.0	0.0
MON-1	1.1	0.2	--	--
MON-2	5.0	5.9	3.2	0.2
MON-3	14.8	4.1	6.1	0.5
MON-4	2.5	2.1	40.0	16.5
MON-5	0.4	2.4	12.3	30.0
Mean & SE	4.76(2.63)	2.94(0.96)	12.32(7.21)	9.44(6.03)
HAZ-1	12.3(12.3)	13.6(13.6)	0.0	0.0
RAP-1	7.9	3.5	--	--
RAP-2	9.8	15.3	3.9	2.9
Mean & SE	8.85(0.95)	9.4(5.9)	1.95(1.95)	1.45(1.45)

mainly wild and discrete. One third of the fish sampled in Area 3 were juveniles, i.e., this area is good for rearing as well as for adult holding. Only 7% of the trout caught in Area 1 were juveniles. Most of this area is flat and sandy bottomed, not good rainbow trout juvenile rearing habitat.

Ninety-two percent of all fish captured in the study were wild. Mean length of wild trout was 28 cm, and mean length of hatchery trout was 32 cm (Fig. 22). The main reason for the size difference is that hatchery trout were planted at catchable size, i.e., longer than 20 cm.

Snorkel Monitoring of Juvenile Salmonid Densities

Densities of each salmonid species are presented in Tables 26 and 27 for the SFSR and other streams, respectively. Trends in densities of chinook salmon and steelhead trout are of interest statewide since various programs are in effect to restore anadromous fish numbers after Idaho's anadromous fish runs dropped to dangerously low numbers in the mid-1970's. Trends in cutthroat trout numbers in the SFSR are also of interest since catch-and-release regulations for cutthroat trout were established in the drainage in 1986 as a means to increase cutthroat survival. A comparison of densities of these three species in the SFSR is presented in Table 28. Both steelhead and chinook rebounded in 1986 above 1984 levels after dropping down in 1985. Chinook made the most significant increase, more than doubling the 1984 density. Cutthroat densities remained unchanged. Table 28 also demonstrates the distribution pattern of the three species where Transect 5 is the upper most transect near Stolle Meadows and Transect 28 is the lowest transect near the SFSR mouth. Steelhead densities showed no obvious trend throughout the system, but chinook were denser in the upper transects and cutthroat denser in the lower transects.

Data is available from 1984 through 1986 for SFSR transects and from 1985 through 1986 in all other transects (Table 29). In the latter transects, densities of both steelhead and chinook juveniles increased significantly from 1985 to 1986. The only exception was a decrease in chinook density at one Rapid River transect. Both transects at Marble Creek and one at Rapid River had no chinook juveniles in either 1985 or 1986.

DISCUSSION

Rainbow Trout Fishery in the Cabarton Reach of the North Fork Payette River, 1986

The Cabarton reach is unique in the west-central Idaho area in that it provides an isolated walk-in stream fishery for wild rainbow trout that is close to both the Boise and McCall areas. Catch rate is generally in excess of one fish per hour and the population contains a

significant portion of trophy-size fish. Fishing pressure is low, perhaps due to the walk-in requirement, but also of significance is the discharge regime. The river is high during most of the summer season, since this area of the NFPR is a conduit for Emmett valley's irrigation
water which is stored in Cascade Reservoir (Fig. 23). The result is marginal summer fishing conditions, but enhanced summer survival because of low fishing mortality and an artificially expanded environment. Most recreational use in the Cabarton Reach is by raft and kayak floaters, only a small percent (5%) of which fish during their trips (McLaughlin and Feldman 1983).

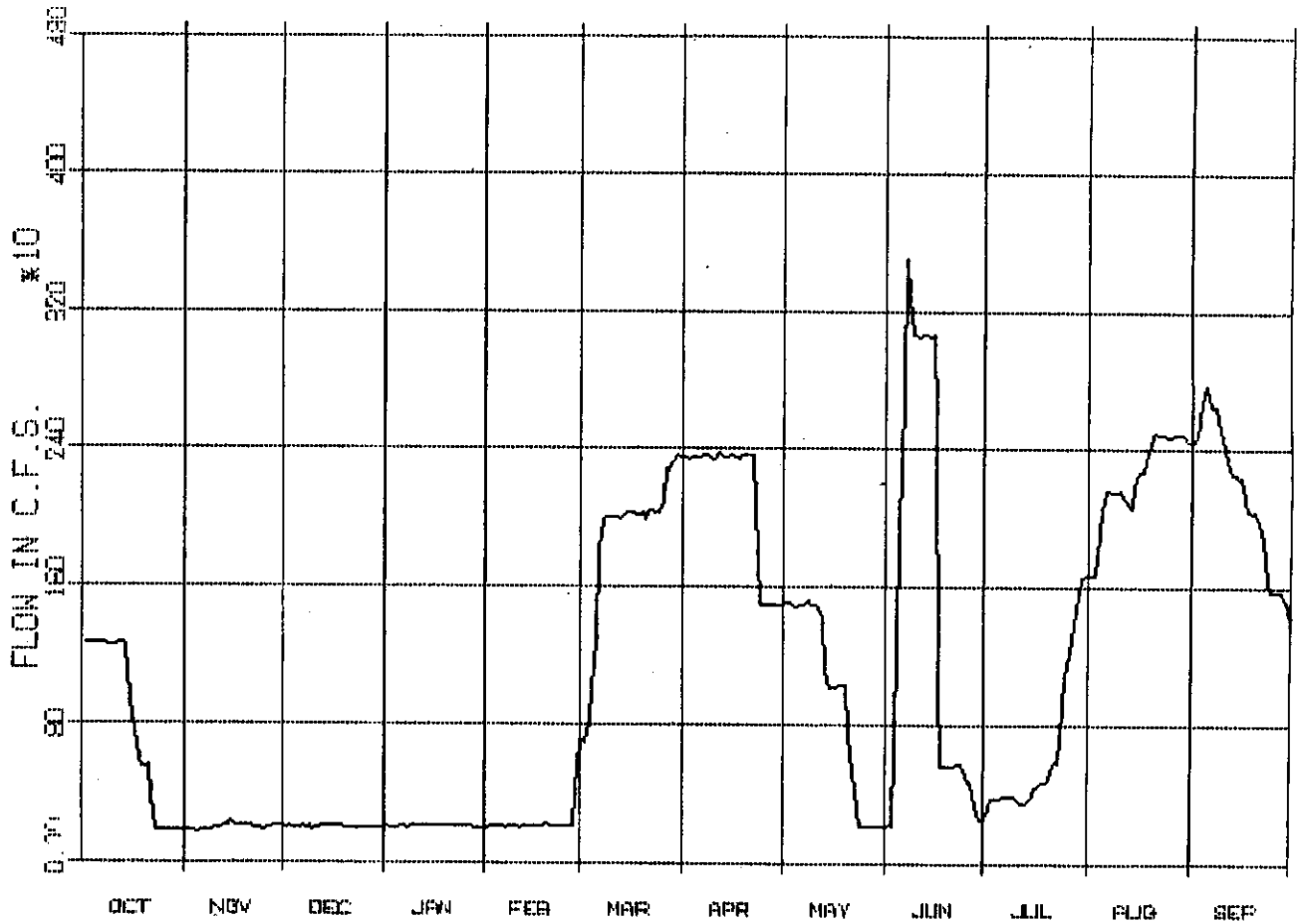

Figure 23. Discharge in cubic feet per second from Cascade Reservoir, October 1985 through September 1986. Figure provided by the U.S. Bureau of Reclamation.

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Thurow, R. 1987. Evaluation of the South Fork Salmon River steelhead trout fishery restoration program. U.S. Department of Interior, Fish and Wildlife Service. Lower Snake River Fish and Wildlife Compensation Plan. Contract No. 14-16-0001-86505.

State of: Idaho

Project No.: F-71-R-11

Job No.: 3(MC)-d

Name: REGIONAL FISHERY MANAGEMENT INVESTIGATIONS

Title: McCall Subregion Technical Guidance

Period Covered: January 1, 1986 to December 31, 1987

ABSTRACT

Technical guidance and review were primarily related to mining, small hydroelectric and federal land management projects. Over 300 requests and opportunities for technical input were addressed. Primary mining concerns were with the Dewey Mine (Monumental Creek drainage), Sunnyside Mine (Marble Creek drainage) and Stibnite Mine (East Fork of South Fork Salmon River drainage). Persistent activity of small hydro applicants has demanded field review and written input in several areas of the region from the Weiser River to the Salmon River. The review of land use planning documents allowed input on long-term decision making.

Author:

Don Anderson
Regional Fisheries Manager

OBJECTIVES

1. To provide technical guidance to city, county, state, federal, and private land management agencies and developers.

TECHNIQUES USED

We conducted field inspections, attended meetings and provided technical comment to land management agencies and private corporations and individuals regarding activities that may have an impact on the fishery resources.

FINDINGS

Mining Operations

Large-scale mining operations required continued review and comment on plans and changes to plans. Current (Dec. 1986) status is:

Dewey Mine continued in "housekeeping" status, and Idaho Department of Lands (IDL) received $25,000 bond money for reclamation. Idaho Department of Health and Welfare also received nearly $25,000 in fines for water quality violations. Both agencies requested IDFG's input as to how the money would best be spent. Nearly the entire amount was dedicated to stabilizing sources of sediment to the fish habitat in Monumental Creek. Snorkel surveys of affected and unaffected areas continued in Monumental Creek.

Sunnyside Mine began mining and processing ore this year. Even though the operation is entirely on patented land, a sensitivity to water quality and fish habitat has been demonstrated. Adequate monitoring by the company is still lacking, but no obvious problems have occurred.

Stibnite Mine was purchased by Pioneer Metals and reopened in 1986. They inherited weakened operating and reclamation plans and have requested several major changes from the EIS. We have continued to impress the sensitive nature of the South Fork Salmon River (SFSR) drainage and the fish populations. Having a new operator at Stibnite might allow completion of needed reclamation that was left undone when Canadian Superior closed down.

Small-Scale Mining Operations

Over 30 small dredge and placer mines operated at various levels of intensity. Review, inspection and providing comments to the appropriate regulatory agencies allowed the IDFG to help minimize impacts to fish habitat as a result of these water-based mining activities. The nature of dredge and placer mining places aquatic systems at high risk of degradation. Most mines are located on flood plains and generally are within riparian zones. Regulation and enforcement are difficult. Early communication of fish habitat requirements to the operators and cooperation with the State and Federal regulatory agencies is the most effective method to reduce negative impacts.

Small Hydroelectric Projects

Comments were provided on sixteen proposed small hydroelectric projects. Most of these projects are located on Salmon River tributaries and have high potential to impact sensitive fish species including wild salmon and steelhead. The IDFG requested cumulative analysis of potential impacts resulting from the several Salmon River projects. Much input was provided to the Federal Energy Regulatory Commission regarding existing fish population and potential impacts to fish habitat. The main concerns include flow reduction, increased sedimentation, fish passage and reduced benthic production.

Land Management Activities

The Regional Manager attended several meetings with the Payette and Boise National Forests regarding proposed activities in the SFSR. The meetings were different from years past because these activities were designed to improve fish habitat rather than for proposed timber sales. Again, the SFSR Monitoring Committee recommended against any activity with the potential to contribute sediment to the SFSR or its tributaries.

The major involvement with the Payette National Forest this year was the review and comment of their Draft Forest Plan and EIS. Our critical review of the draft appears to have caused some significant changes in the upcoming final forest plan. One method of involvement was participation in a consensus group composed of various agencies that included Indian tribes, forest industry, conservation clubs and outfitters. Eventually, this group agreed that the restoration of fish habitat is the best first step in solving the problems in the SFSR.

State of: Idaho

Project No.: F-71-R-11

Job No.: 3(MC)3-e

Name: REGIONAL FISHERY MANAGEMENT INVESTIGATIONS

Title: McCall Subregion Salmon and Steelhead Investigations

Period Covered: January 1, 1986 to December 31, 1987

ABSTRACT

Region 3 salmon and steelhead investigation data is incorporated in the separate statewide "Salmon and Steelhead Investigations" report.

Author:

Don Anderson
Regional Fisheries Manager

ACKNOWLEDGMENTS

The regional fishery manager and fishery biologist wish to thank the following people for their assistance:

Bill Arnsberg and Judy Hall-Griswold for data collection, analysis and report writing; Conservation Officers Jerry Lockhart, Walt Arms, Fred Edwards, Ed Bottom and Don Stucker for data collection; Bio-Aides Richard Hurvey, Bob Cordtz and Dave Venditti for data collection; and Fish Culturist Craig Hoover for data collection. In addition, Office Secretary Judy Wallace deserves special appreciation for the many hours of typing various drafts and the numerous data tables in this report.

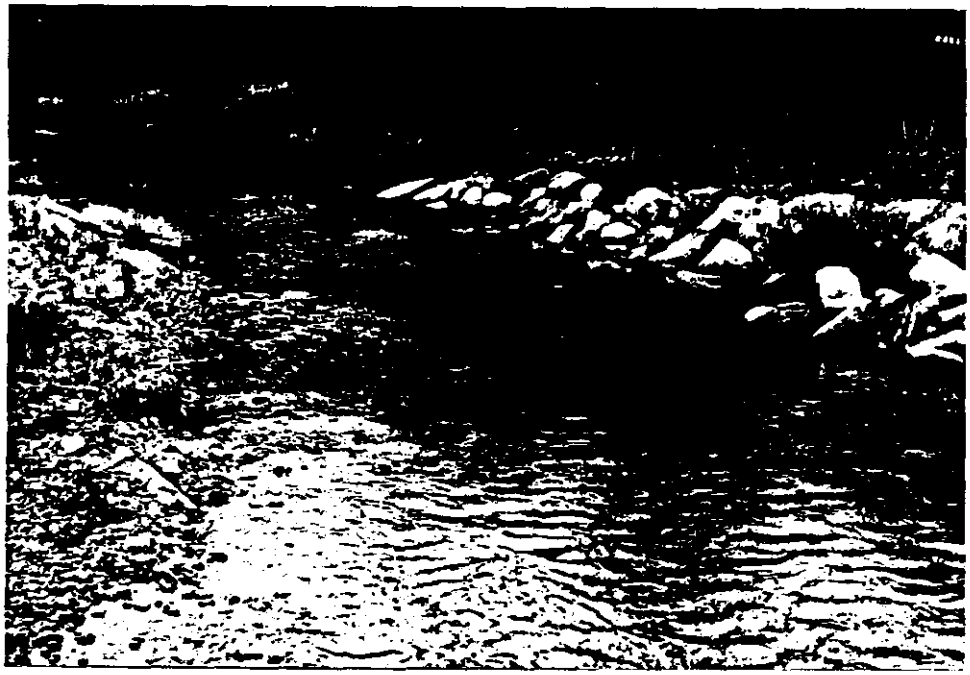
APPENDICES

Appendix 1. SFSR Snorkel transect descriptive drawings, photographs, and written directions.

Transect Description Sheet

Transect No. SFSR #5

Location PARK AT ENTRANCE OF CLOSED ROAD (ACROSS FROM WARM LAKE I SIGN) Walk to bridge.



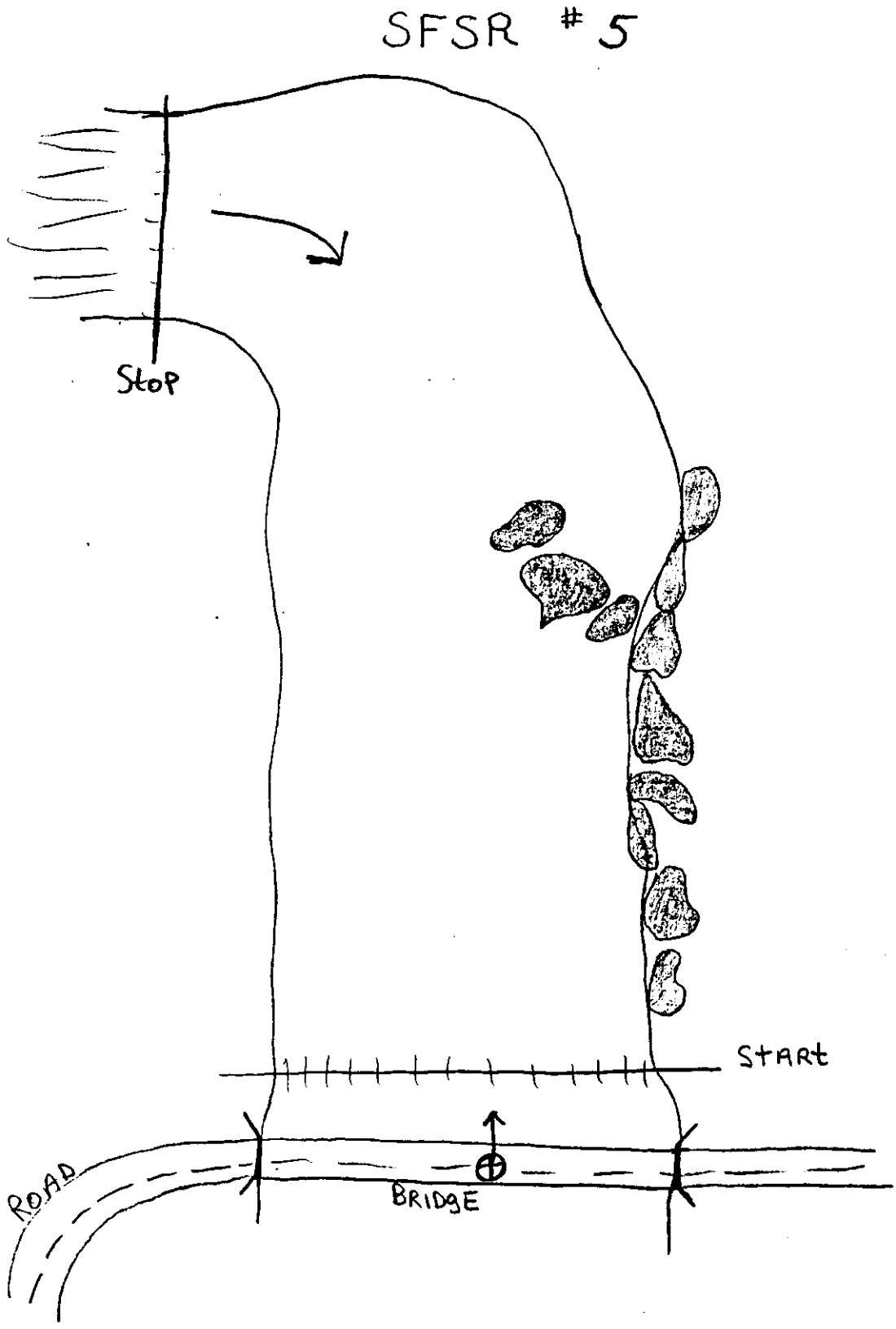
Vehicle Access WARM LAKE Rd.

Point of Photo FROM BRIDGE UPSTREAM.

Transect Description STARTS imm. Above bridge. ENDS imm After first bend.

Comments

Map on Back


SFSR #5
Stop
START
ROAD
BRIDGE

Transect Description Sheet

Transect No. SFSR #7

Location ~50 M. below mouth of Dime Cr. Along Rock Ledge.

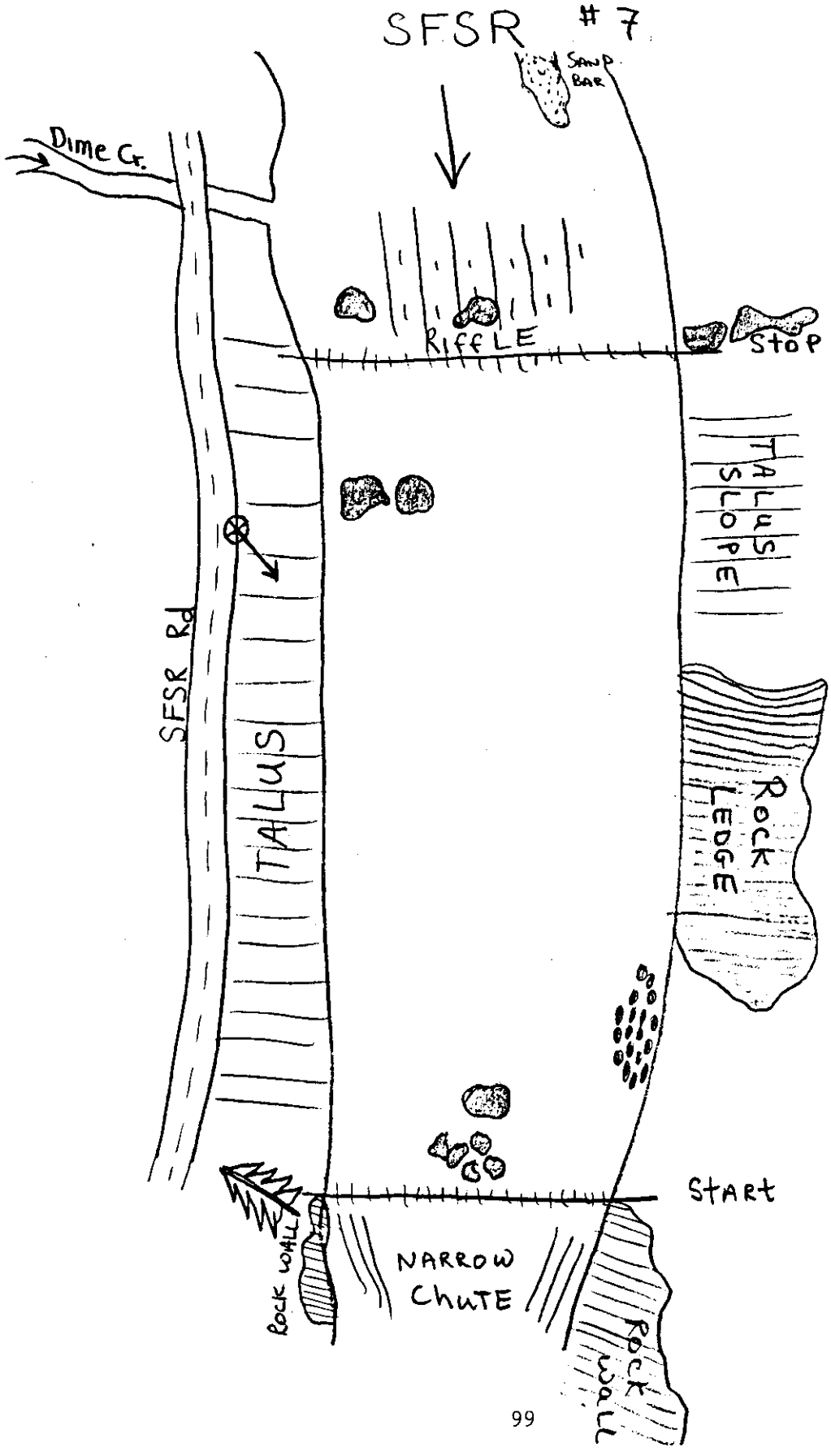
Vehicle Access SFSR Rd.

Point of Photo From Road Looking Downstream

Transect Description Park At Dime Cr. Walk down SFSR to Rock Ledge (~50 m) ENDS at Chute Above Ledge.

Comments

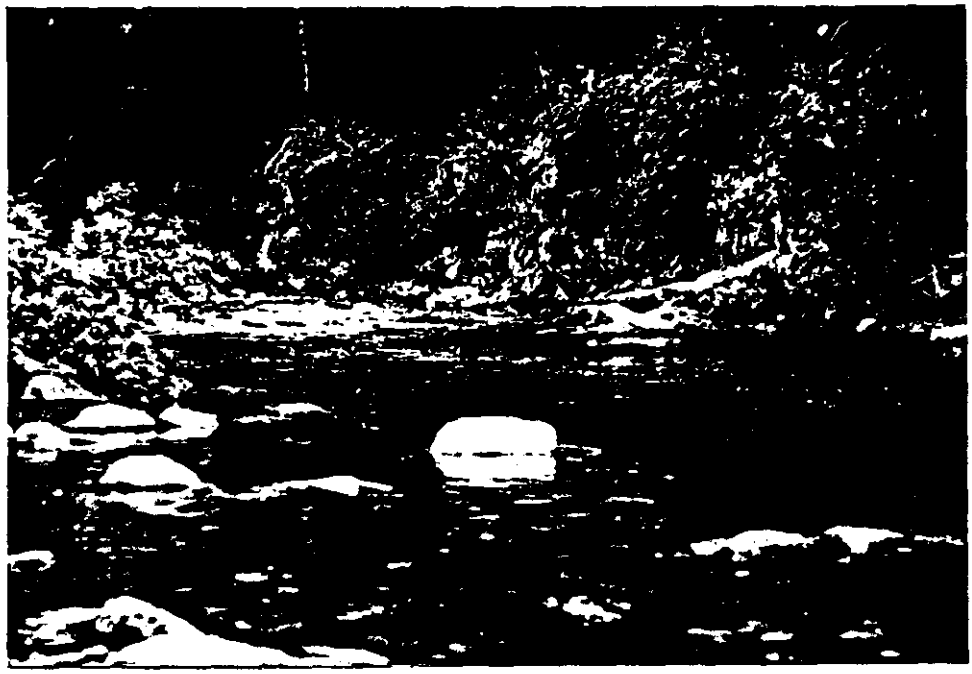
Map on Back


SFSR #7
SAND BAR
Dime Cr.
RIFFLE
STOP
TALUS SLOPE
SFSR Rd
TALUS
ROCK LEDGE
START
ROCK WALL
NARROW CHUTE
ROCK WALL

Transect Description Sheet

Transect No. SFSR #11

Location Imm. below ISLAND Above Four Mile Cr.
0.1 mile to turnout from Top of ISLAND.



Vehicle Access SFSR Rd.

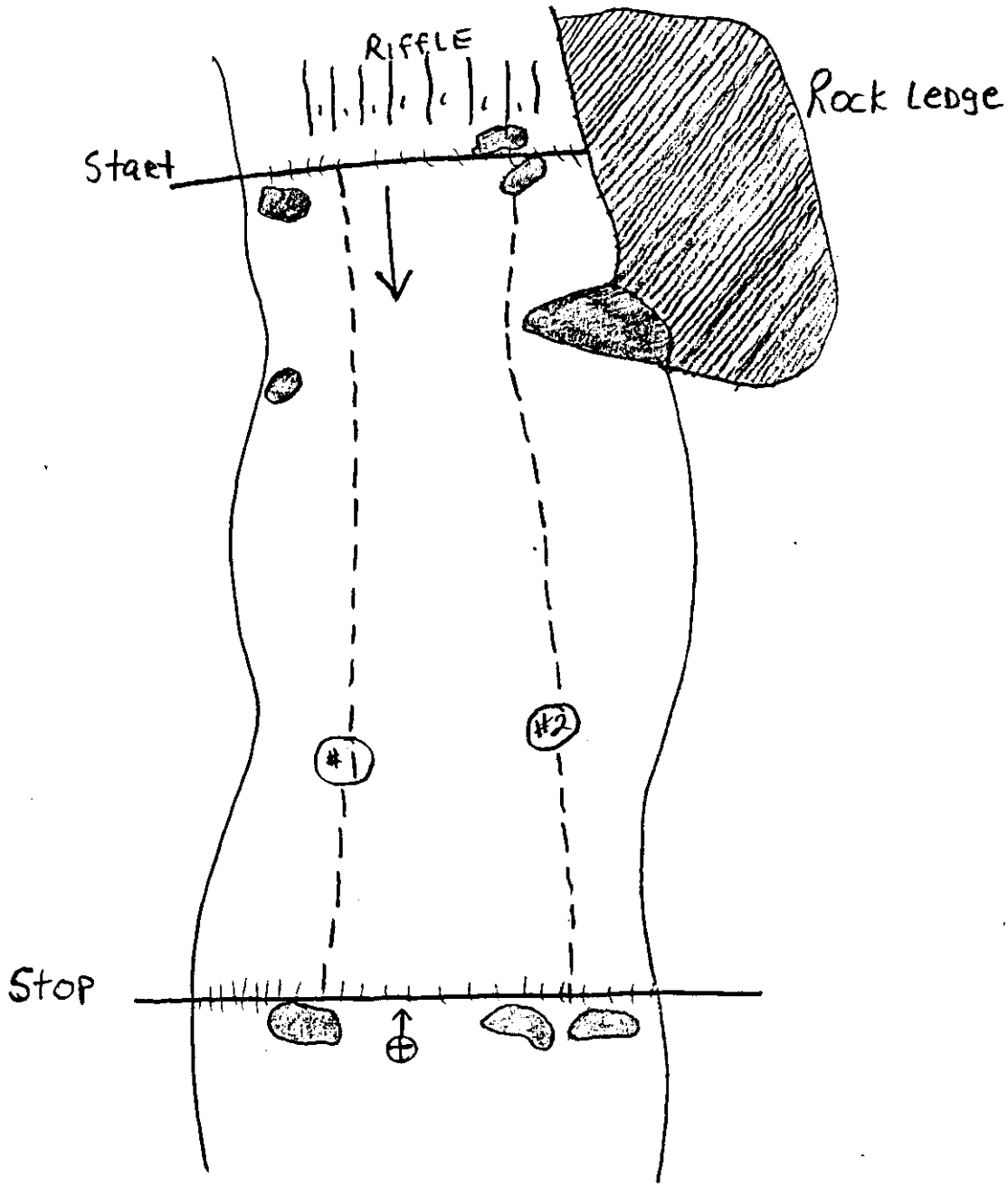
Point of Photo Base upstream

Transect Description Starts imm below Riffle adjacent to large Rock Ledge imm below ISLAND above Four Mile Cr.

Comments

Map on Back

SFSR #11



Transect Description Sheet

Transect No. SFSR # 14

Location Pool At Tepee Camp Ground.

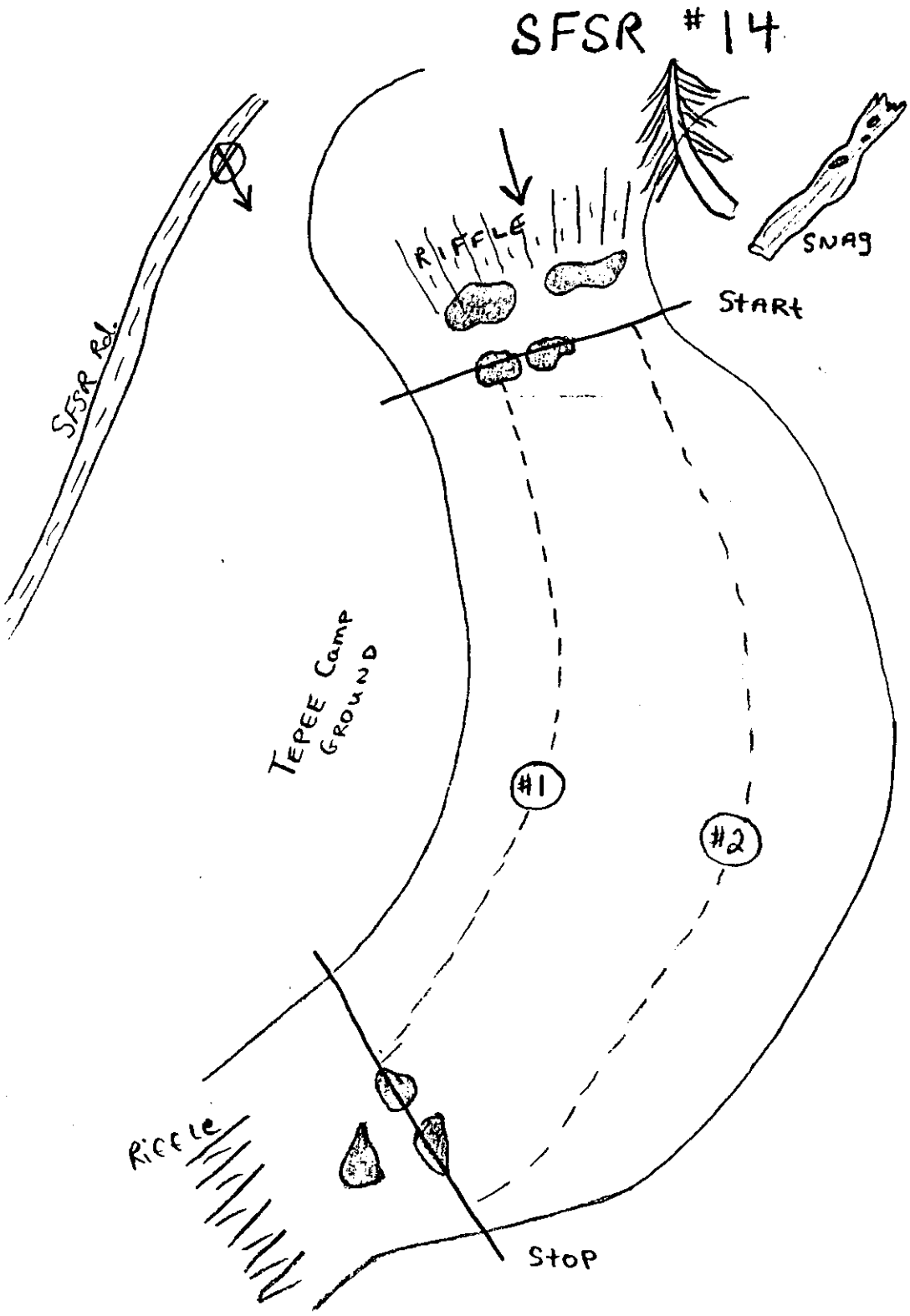
Vehicle Access SFSR Rd

Point of Photo From Road Above Start downstream.

Transect Description Starts At Boulder Adjacent to SNAG
ENDS At Riffle below Pool.

Comments

Map on Back


SFSR #14
SFSR Rd.
RIFFLE
SNAG
START
TEPEE CAMP GROUND
#1
#2
RIFFLE
STOP

Transect Description Sheet

Transect No. SFSR # 16

Location Begins 0.3 mile below Fitsum Cr. Sign on SFSR Rd.

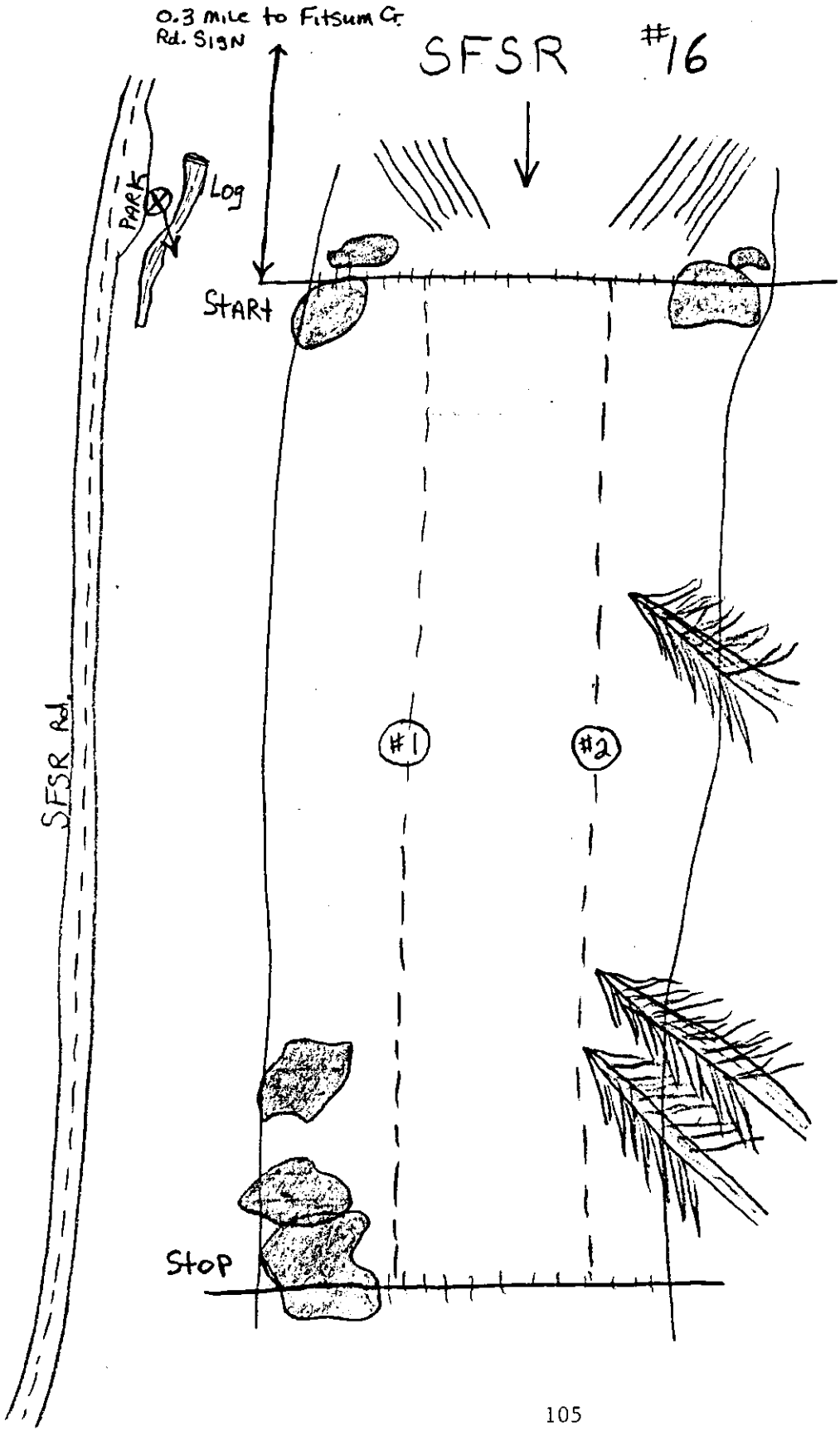
Vehicle Access SFSR Rd.

Point of Photo From edge of Park Turn out downstream.

Transect Description Starts at chute 0.3 miles below Fitsum Cr Sign on Road and ends on flat 1mm. below large boulders.

Comments

Map on Back


0.3 mile to Fitsum Cr. Rd. Sign
SFSR #16
PARK
Log
START
SFSR Rd.
#1
#2
Stop

Transect Description Sheet

Transect No. SFSR # 18

Location ENDS At Mouth of Sheep Cr.

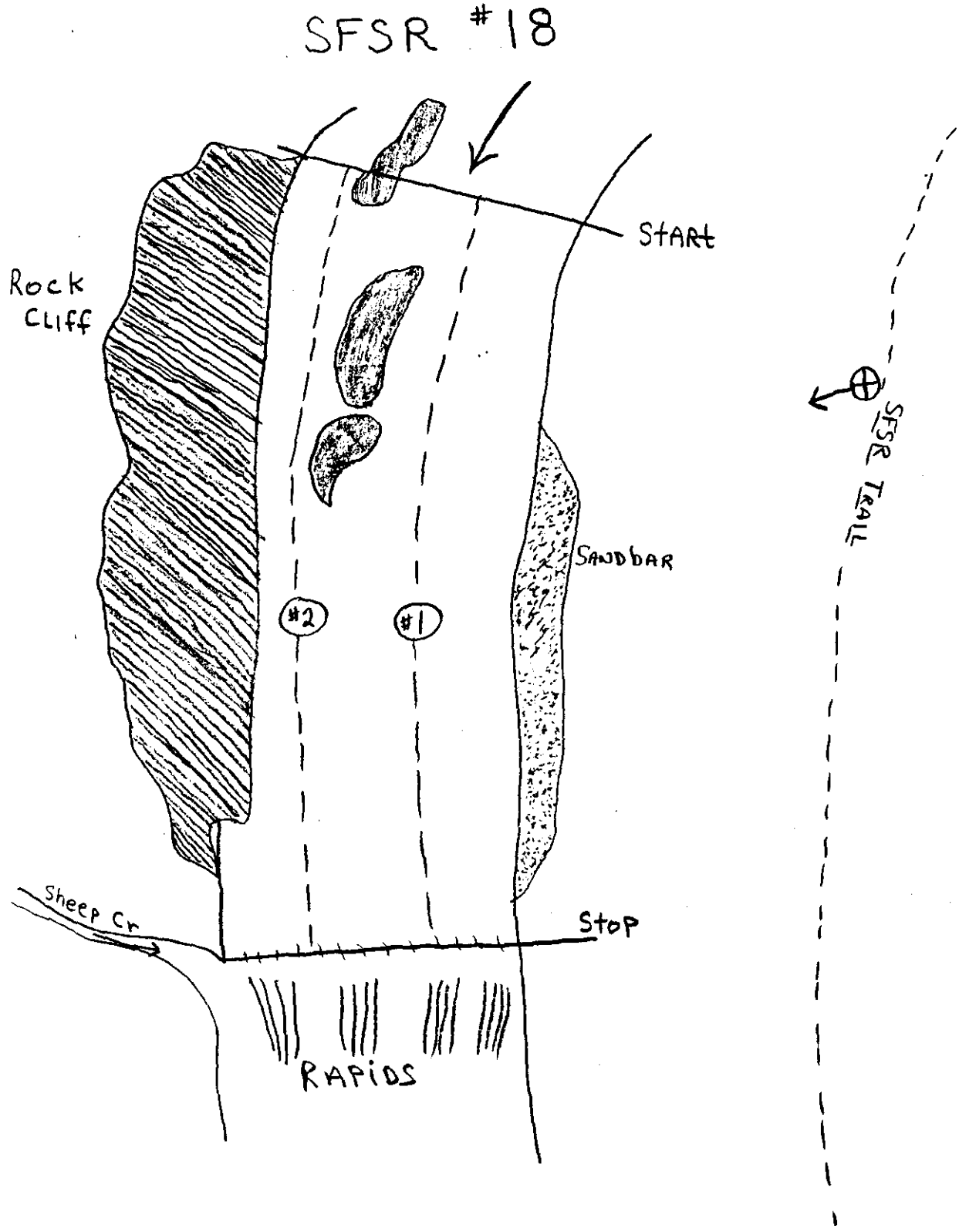
Vehicle Access SFSR TRAIL

Point of Photo FROM TRAIL Above Sandbar downstream

Transect Description Starts ADJACENT to upstream edge of Rock Cliff on opp. Shoreline. ENDS At mouth of Sheep Cr.

Comments

Map on Back


SFSR #18
START
Rock
Cliff
SANDBAR
#2
#1
Sheep Cr
STOP
RAPIDS
SFSR TRAIL

Transect Description Sheet

Transect No. SFSR #19

Location Begins Adjacent to Mouth of ~~Meadow~~ Reservoir Cr.

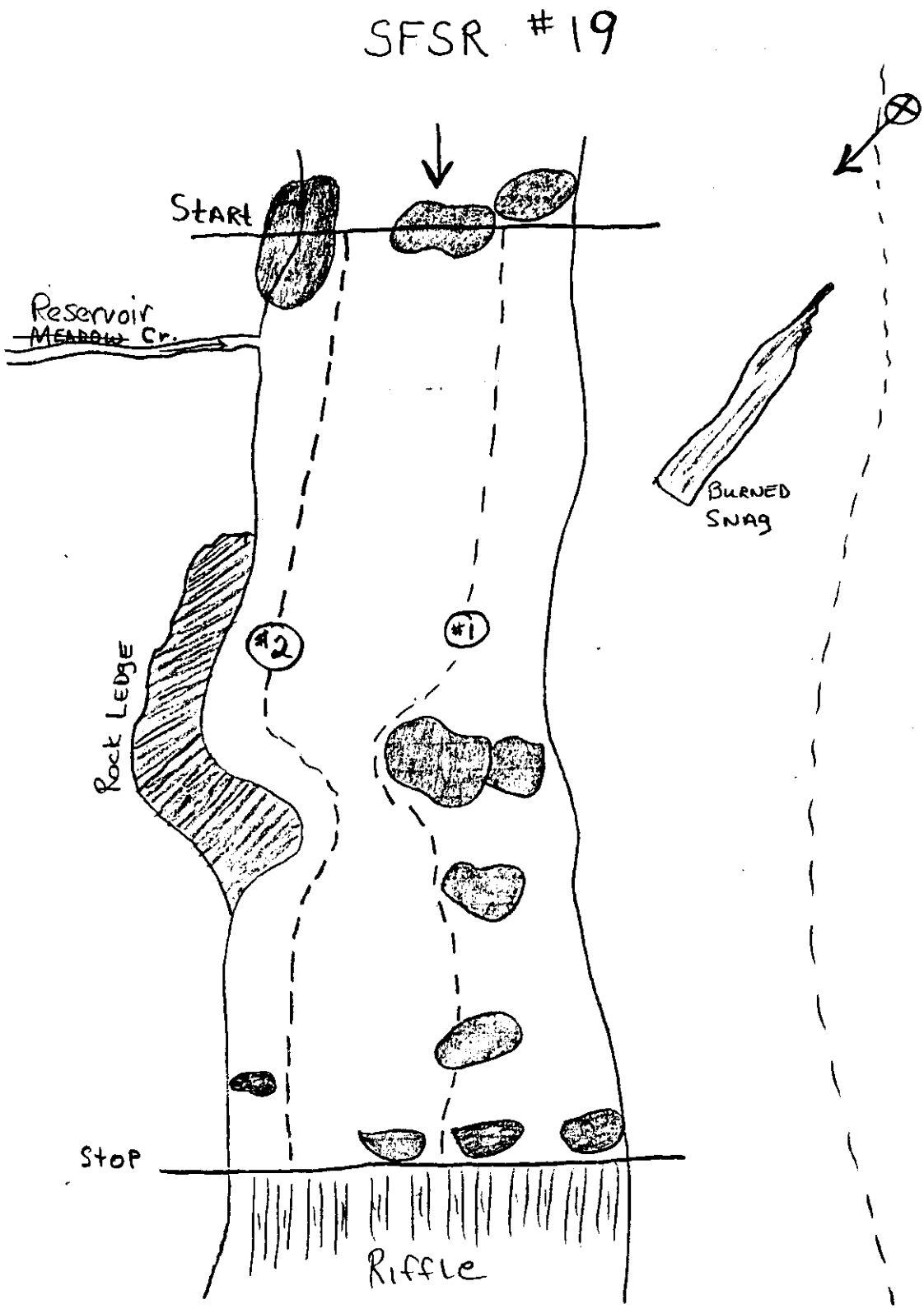
Vehicle Access SFSR TRAIL

Point of Photo From trail downstream toward creek and snag.

Transect Description Starts at Boulder Above mouth of Meadow Cr. ENDS ON Riffle.

Comments

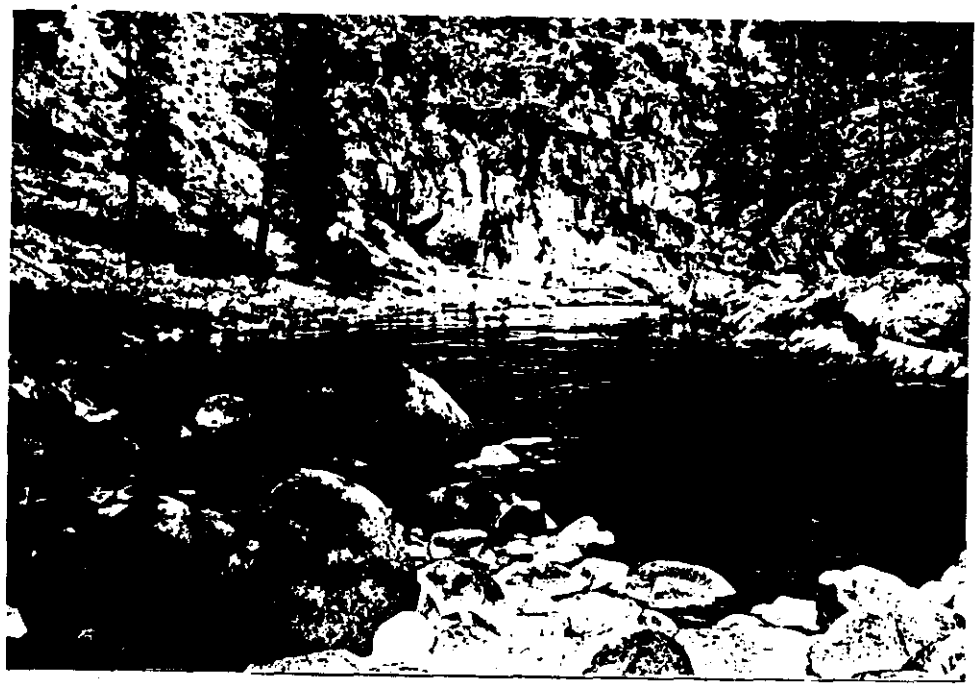
Map on Back


SFSR #19
START
Reservoir
~~MEADOW~~ Cr.
BURNED SNAG
#2
#1
ROCK LEDGE
STOP
RIFFLE

Transect Description Sheet

Transect No. SFSR #20

Location BEGINS AT LARGE boulder imm. below mouth of BEAR Cr.



Vehicle Access SFSR TRAIL

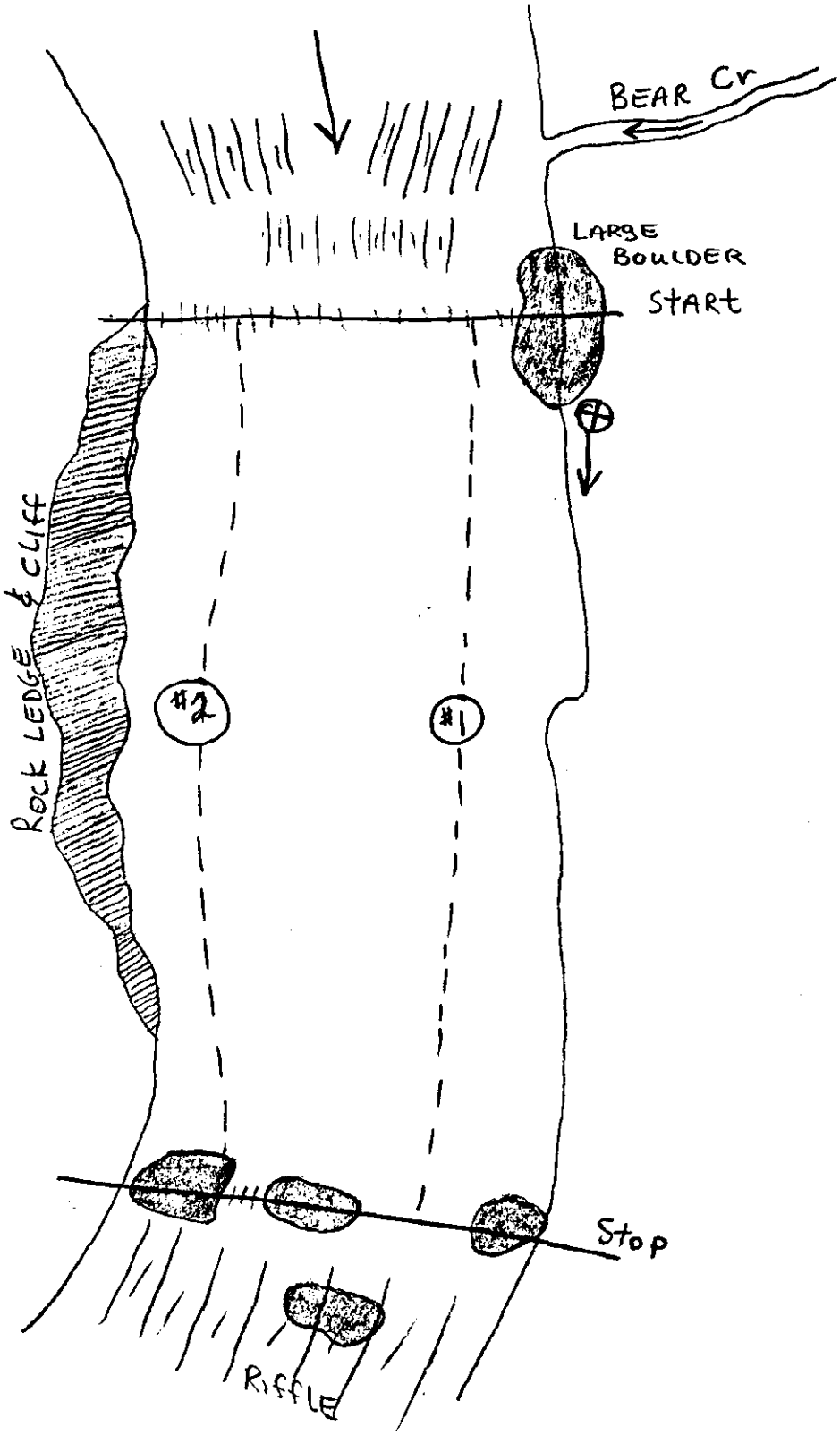
Point of Photo FROM EDGE of LARGE boulder DOWNSTREAM.

Transect Description START ADJACENT to LARGE boulder imm. below mouth of BEAR Cr. ENDS imm ABOVE RIFFLE below ROCK LEDGE.

Comments

Map on Back

SFSR #20

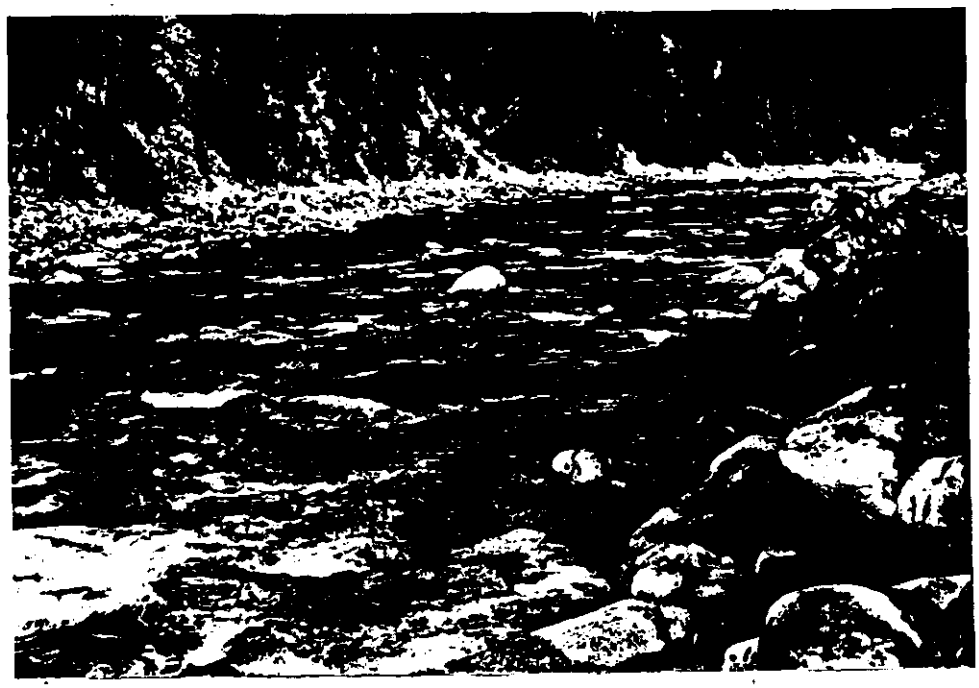


SFSR trail

Transect Description Sheet

Transect No. SFSR # 21

Location Starts ~ 200 m. Below mouth of ELK Cr.



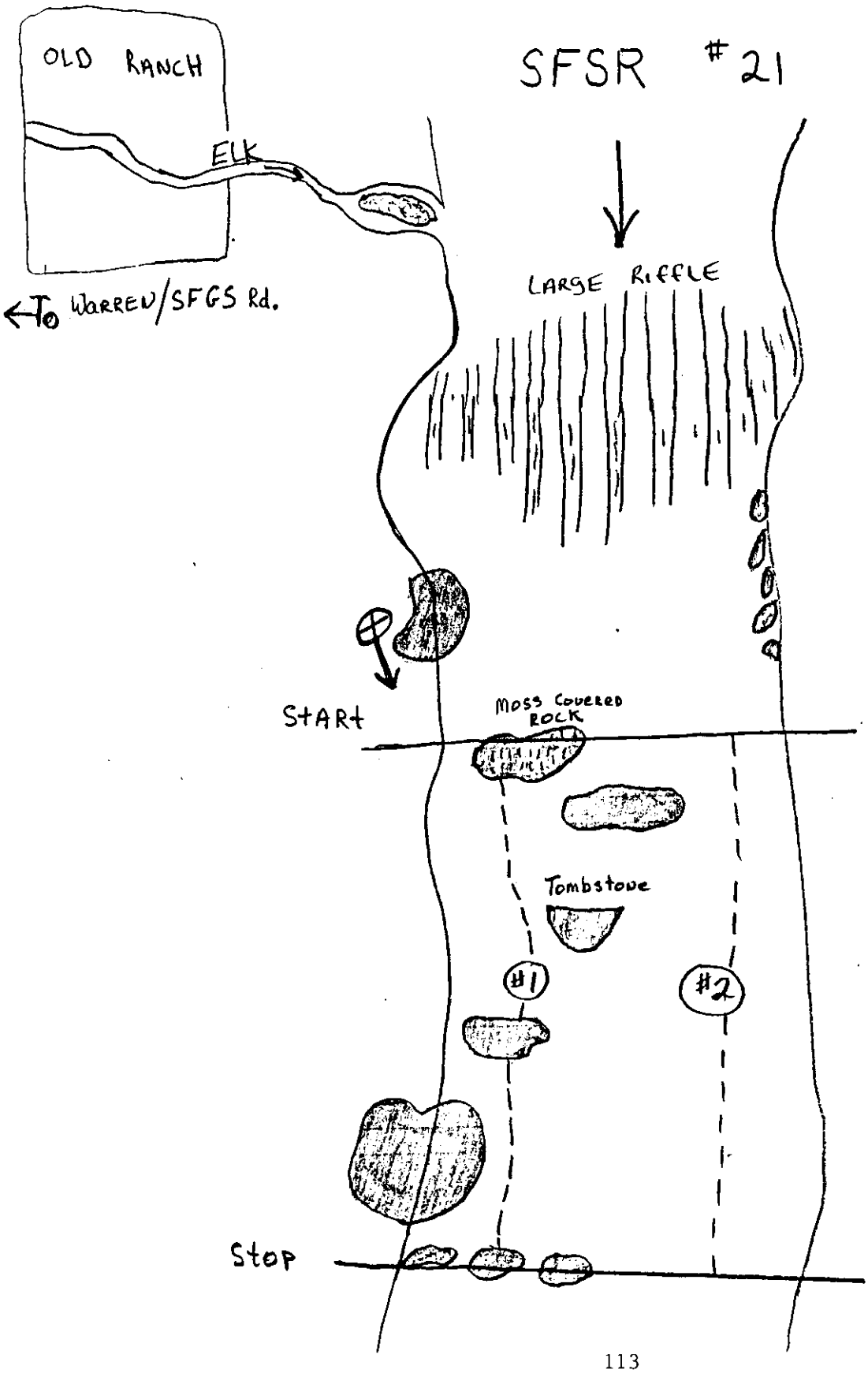
Vehicle Access ROAD from WARREN to S.F. GUARD Station

Point of Photo From START downstream

Transect Description Starts below Riffle ~ 200 m. below mouth ELK Cr. ENDS 1mm. below large boulder.

Comments

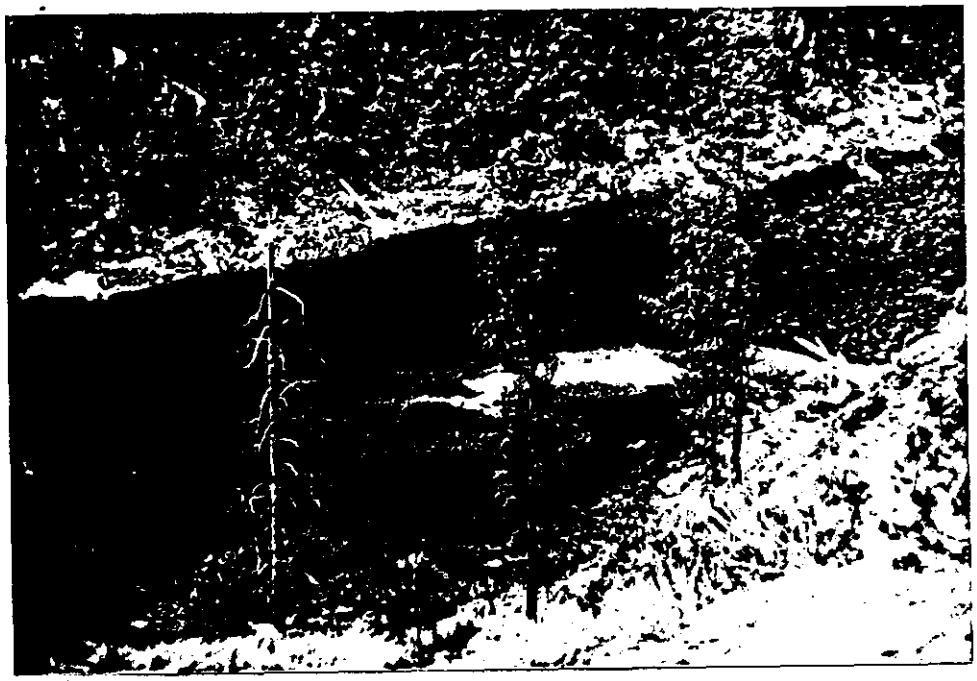
Map on Back


SFSR #21
OLD RANCH
ELK
To Warren/SFGS Rd.
LARGE RIFFLE
START
MOSS COVERED ROCK
Tombstone
#1
#2
Stop

Transect Description Sheet

Transect No. SFSR #22

Location First Large Pool below SF bridge at Guard Station



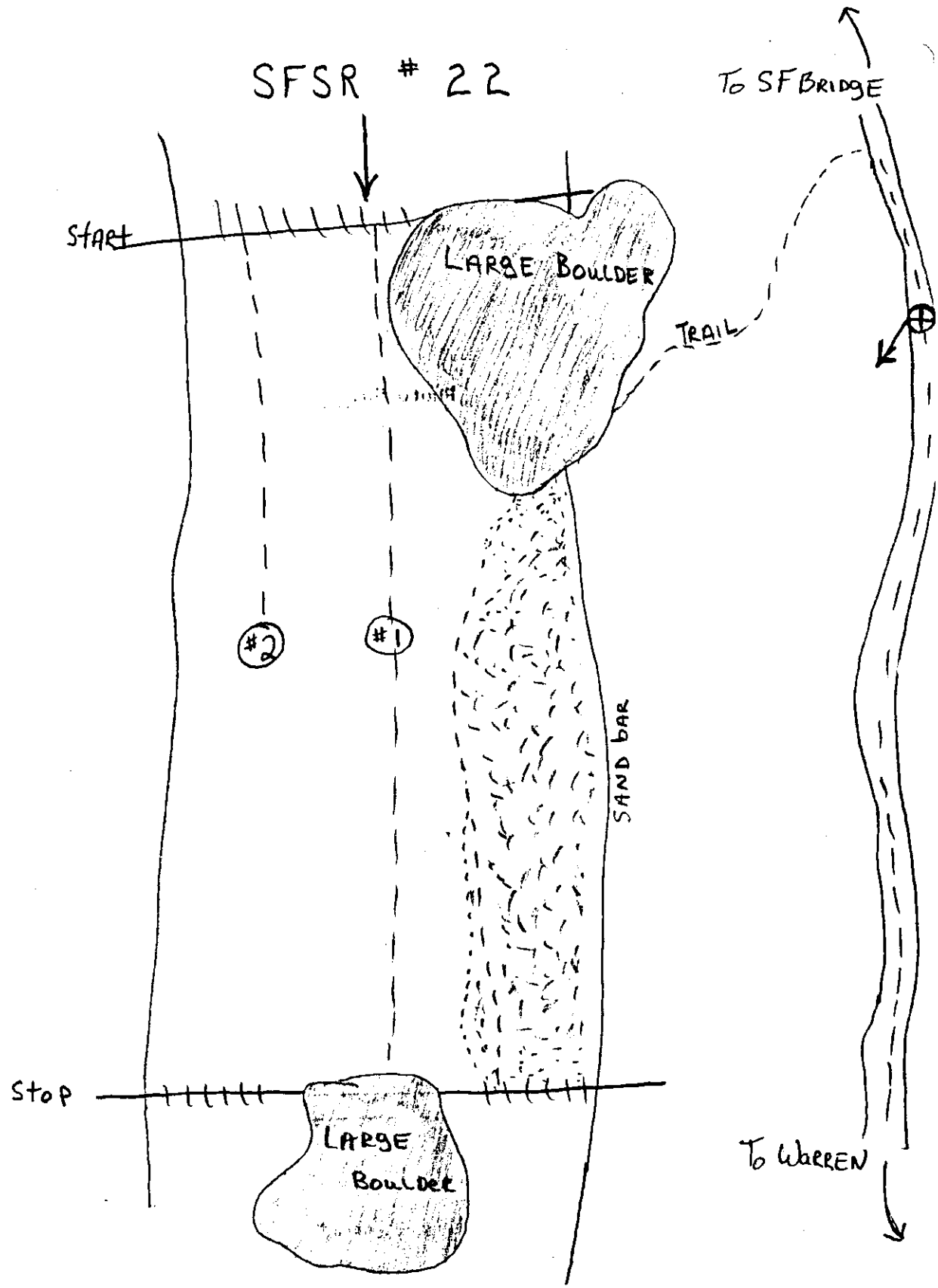
Vehicle Access Road from Warren to SFGS.

Point of Photo From Rd Downstream

Transect Description Starts at Large boulder (trail from Rd down to it). Ends adjacent to large boulder in middle of SFSR.

Comments

Map on Back


SFSR # 22
To SF Bridge
Start
LARGE Boulder
TRAIL
#2
#1
SAND bar
Stop
LARGE Boulder
To Warren

Transect Description Sheet

Transect No. SFSR # 24

Location LARGE Pool below OLD Cabin at Little Flat Cr.

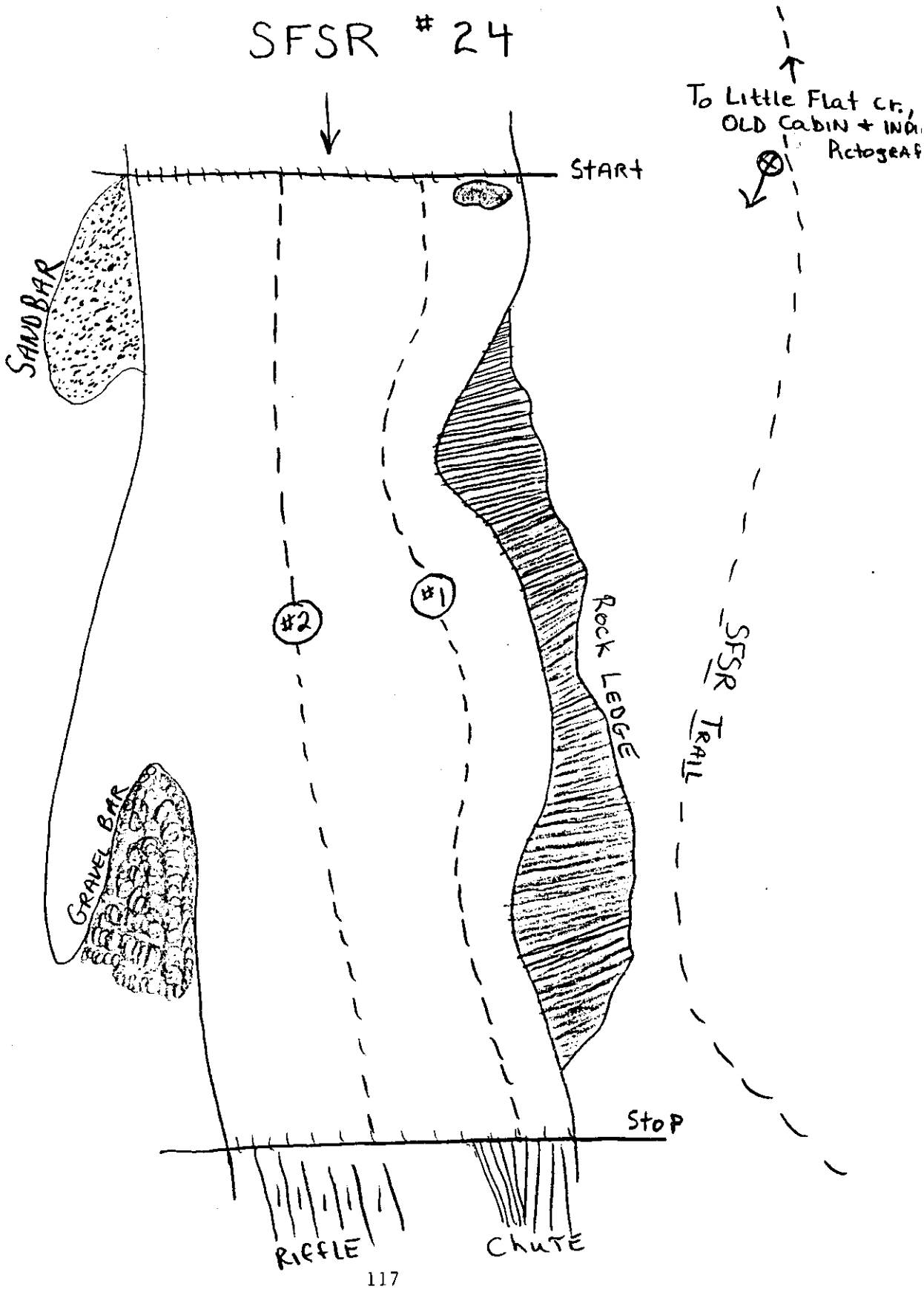
Vehicle Access SFSR TRAIL

Point of Photo FROM TRAIL below Little Flat CR. DOWNSTREAM

Transect Description LARGE POOL AT Rock Ledge below Little Flat Cr.

Comments

Map on Back


SFSR #24
To Little Flat cr.,
OLD CABIN + IND
Rctogeaf
START
SANDBAR
#2
#1
ROCK LEDGE
SFSR TRAIL
GRAVEL BAR
STOP
RIFFLE
CHUTE

Transect Description Sheet

Transect No. SFSR # 25

Location ~500 m. below Knob Cr. where trail re-joins River.

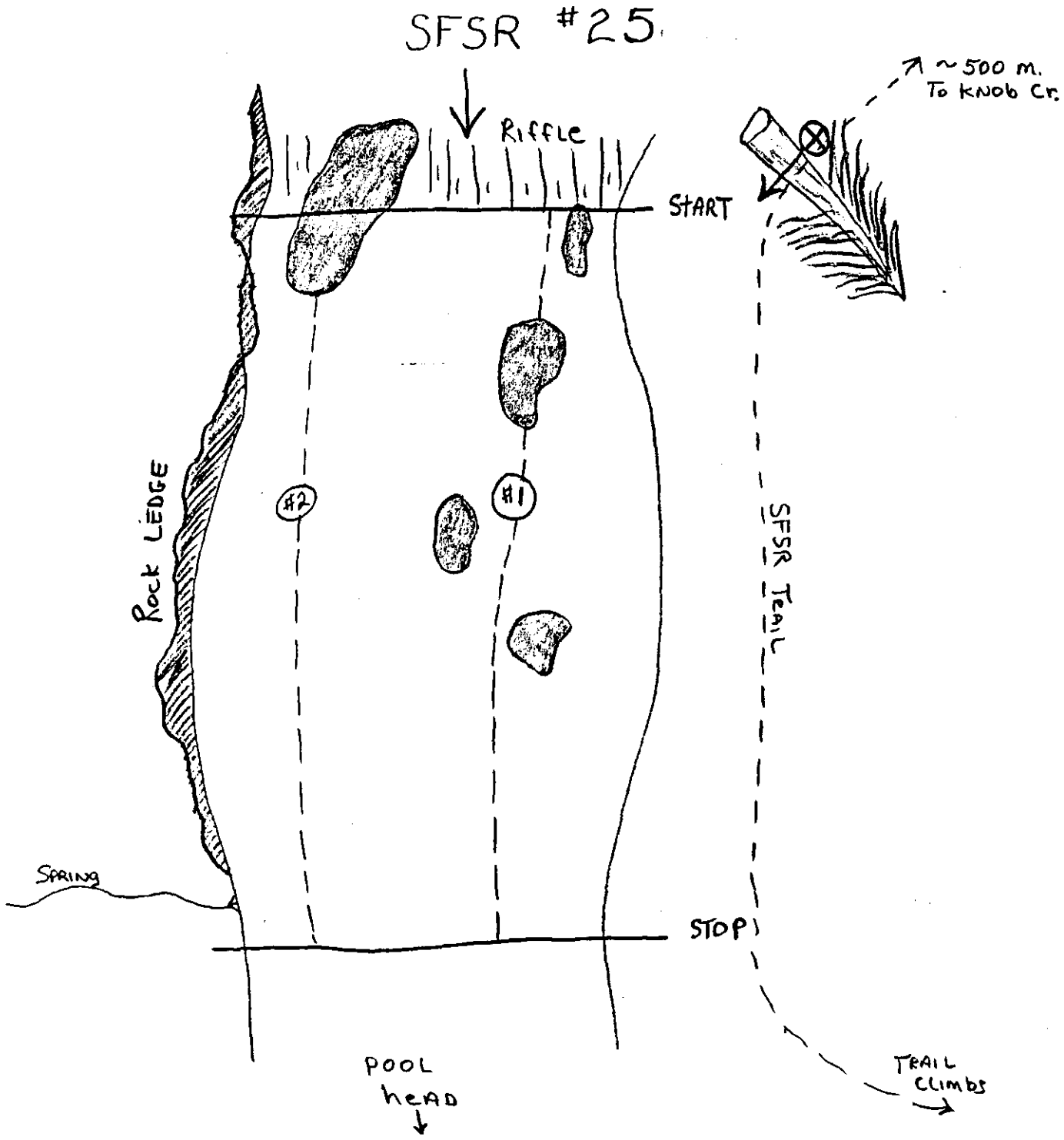
Vehicle Access SFSR Trail

Point of Photo From trail above tree downstream

Transect Description Begins on riffle imm below large tree adjacent to trail. Ends imm above head of pool.

Comments

Map on Back


SFSR #25
~500 m.
To Knob Cr.
RIFFLE
START
#2
#1
ROCK LEDGE
SFSR TRAIL
SPRING
STOP
POOL
head
TRAIL
CLIMBS

Transect Description Sheet

Transect No. SFSR # 26

Location Begins imm. below mouth of Rooster Cr.

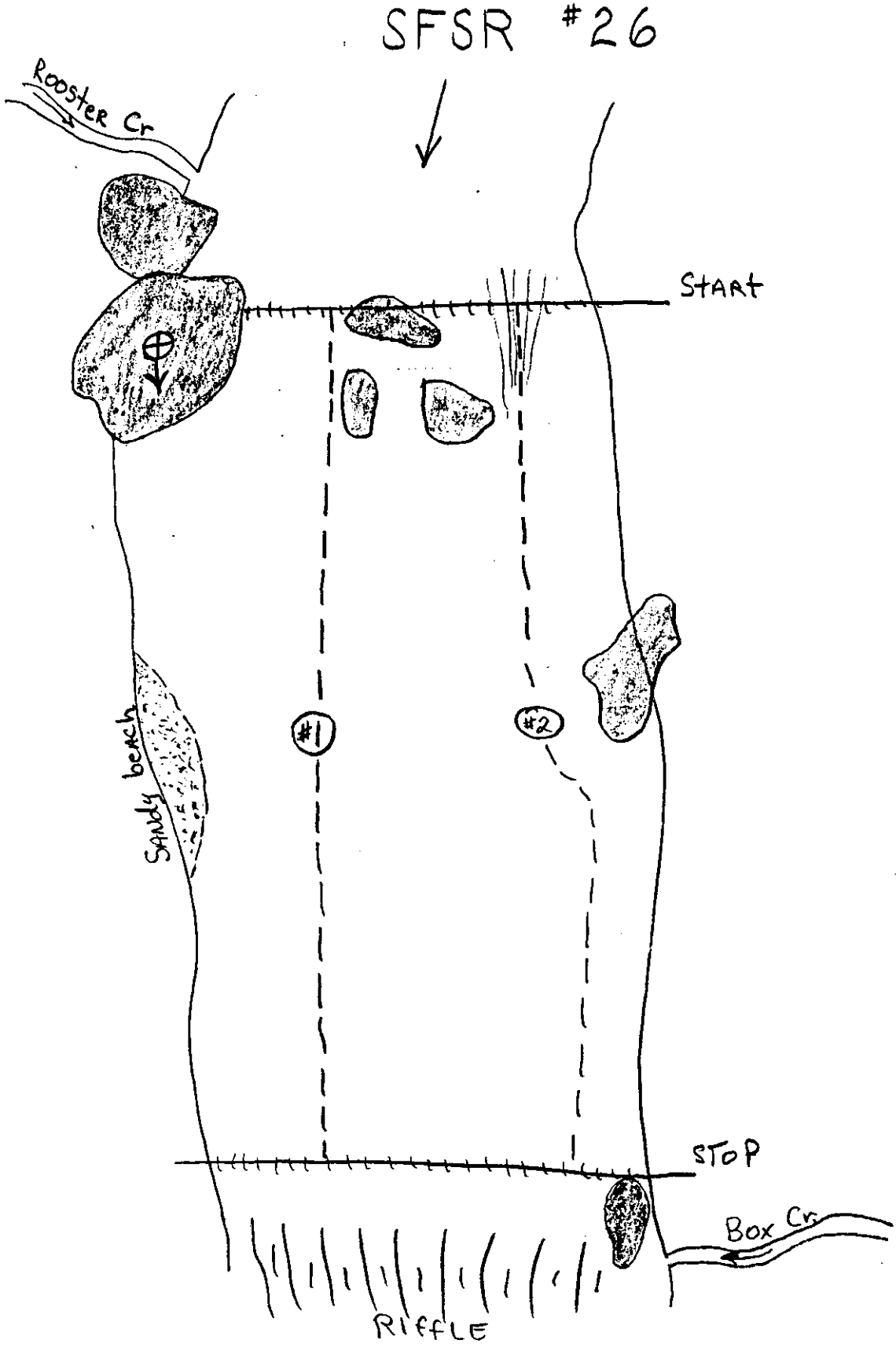
Vehicle Access SFSR TRAIL

Point of Photo From LARGE boulder At START DOWNSTREAM.

Transect Description Starts At large boulder imm. below MOUTH of Rooster Cr. ENDS imm. Above mouth of Box Cr.

Comments

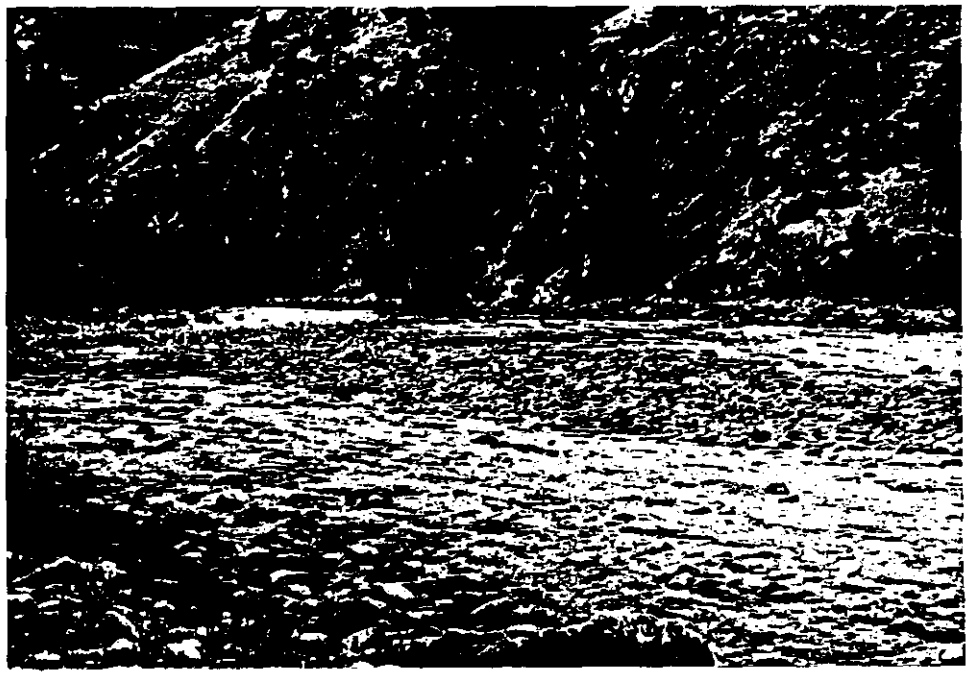
Map on Back


SFSR #26
Rooster Cr
Start
Sandy beach
#1
#2
STOP
Box Cr
Riffle

Transect Description Sheet

Transect No. SFSR # 28

Location First RUN Above mouth.



Vehicle Access SFSR trail

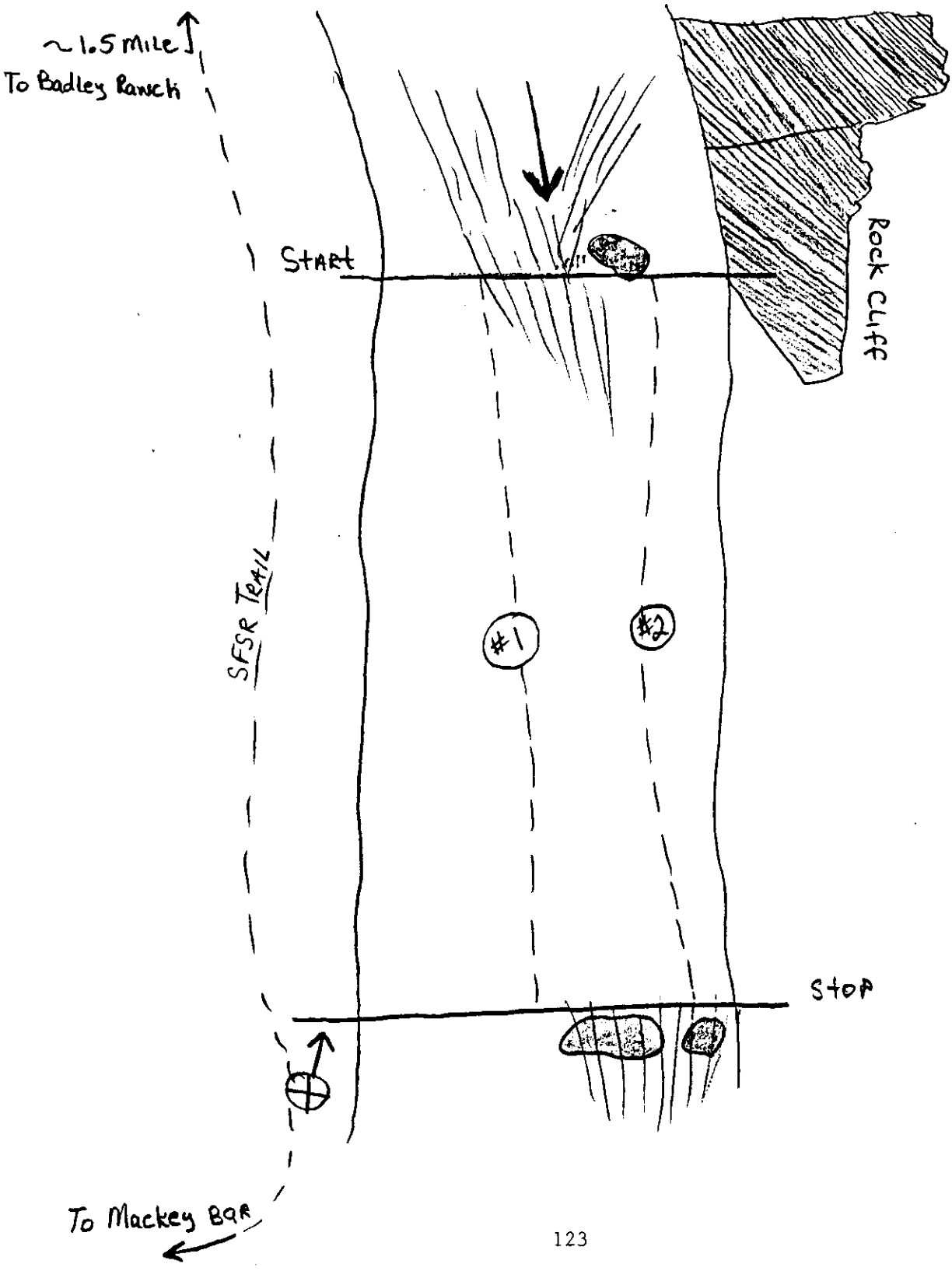
Point of Photo From trail on bend below upstream.

Transect Description Starts Adjacent to Rock cliff on 2ND bend below Badley Ranch.

Comments

Map on Back

SFSR #28


~1.5 mile
To Badley Ranch
START
Rock Cliff
SFSR Trail
#1
#2
STOP
To Mackey Bar

Appendix 2

State of: Idaho

Name: REGIONAL FISHERY MANAGEMENT INVESTIGATIONS

Project No.: F-71-R-11

Period Covered: July 1, 1986 to June 30, 1987

ABSTRACT

CONSERVATION OFFICERS' SPOT CREEL CHECKS

Conservation Officers of the McCall Subregion recorded spot creel checks from 32 fisheries. Mean catch rates on lake, river, stream and reservoir fisheries are near 1.1 fish per hour.

Author:

Dick Scully
Regional Fisheries Biologist

OBJECTIVES

Obtain spot creel survey information on fisheries that would otherwise not be surveyed in most years to provide a comparison of catch rates between several fisheries within and between years.

TECHNIQUES USED

Conservation officers interviewed anglers encountered while on enforcement patrol. Hours fished and the number of fish caught by species were recorded.

FINDINGS

Conservation Officers of the McCall Subregion interviewed anglers at 12 rivers and streams, 12 reservoirs and 8 lakes and reported catches from 7, 199 hours of fishing effort (Table 1). Mean monthly catch rates at each of the three fishery types were 1.1, 1.2 and 1.1 fish per hour, respectively. Game species reported from McCall Subregion fisheries were rainbow trout (and steelhead), brook trout, bull trout, coho salmon, chinook salmon, kokanee salmon, mountain whitefish, yellow perch, channel catfish, brown bullhead, smallmouth bass, largemouth bass, black crappie and bluegill sunfish. Where sufficient data was available on individual fisheries, mean daily catch rates ranged from 0.5 fish per hour in the North Fork Payette River below Cascade to 1.9 fish per hour at Cascade Reservoir. Relative species composition from Cascade Reservoir, which had more than half the fishing effort recorded in spot checks in the subregion, was 772 yellow perch, 15% coho salmon, 8% rainbow trout and less than 1% chinook salmon.

Appendix 2

Table 1. Species compositions and monthly catch rates tabulated from conservation officers' spot creel checks in the McCall Subregion in 1986.

North Fork Payette River (NFPR) System

Month	Hours fished	HRB*	WRB	BRK	WF	RBT	YP	CO	CH	Fish/ hour
Upper Payette Lake										
9	1	--	--	--	--	5	--	--	--	5.0
10	2	--	--	1	--	1	--	--	--	0.4
NFPR near McCall										
3	25.5	--	--	--	68	--	--	--	--	2.7
8	6	5	--	--	--	--	--	--	--	0.8
9	8	9	1	2	--	--	--	--	--	1.5
10	0.5	1	--	--	--	--	--	--	--	2.0
		17%	1%	2%	79%					$\bar{x}$=1.8
Cascade Reservoir										
1	628	44	2	--	--	--	41	215	5	0.5
2	334.5	50	10	--	--	--	257	65	2	1.1
3	435.5	27	10	--	--	--	26	41	4	0.2
4	107	--	--	--	--	26	--	1	5	0.3
5	380.5	--	--	--	--	33	189	5	--	0.6
6	674.5	40	--	--	--	--	685	52	--	1.4
7	559.5	13	--	--	--	--	725	70	--	1.4
8	504	7	--	--	--	--	726	54	--	1.6
9	496	13	--	--	--	--	923	6	--	1.9
10	183	60	--	--	--	--	96	12	--	0.9
12	352.5	47	2	--	--	--	34	218	3	0.9
		6%	0.4%			1%	77%	15%	0.4	$\bar{x}$=1.0

Appendix 2. Continued

Table 1.

Month	Hours fished	HRB	WRB	WF	YP	CO	KO	Fish/ hour
NFPR below Cascade Reservoir								
1	5	--	--	--	--	--	--	0
2	20.5	3	1	17	--	--	--	1.0
3	79.5	6	12	4	1	1	--	0.3
4	40	--	1	--	1	5	--	0.2
5	33.5	7	7	--	--	--	--	0.4
6	29.5	--	6	--	20	--	--	0.9
11	21	15	--	--	--	--	--	0.7
								$\bar{x}$=0.5
Payette Lake								
6	22	--	--	--	--	--	5	0.2
Clear Creek								
6	2.5	--	2	--	--	--	--	0.8
7	1	--	1	--	--	--	--	1.0
Horsethief Reservoir								
6	225.5	44	--	--	--	--	--	0.2
Corral Creek Reservoir								
6	39	6	--	--	--	--	--	0.2
7	46	13	--	--	--	--	--	0.3
Tripod Reservoir								
5	94	102	--	--	--	--	--	1.1
Lake Fork Creek								
5	5	--	--	--	--	--	--	0
Rowland's Pond								
5	3	--	--	--	--	--	--	0

Appendix 2. Continued

Table 1.

Snake River and mainstem reservoirs

Month	Hours fished	SH	HRB	SUCK	CC	WF	CARP	WRB	SMB	BB	YP	BC	BG	Fish/ hour
Snake River below Hells Canyon Dam														
9	4	5	3	1	--	--	--	--	--	--	--	--	--	2.3
10	6	--	--	--	1	--	--	--	--	--	--	--	--	0.2
Hells Canyon Reservoir														
2	9	2	11	--	--	56	--	--	--	--	--	--	--	7.7
3	88	2	20	--	--	1	--	--	--	--	--	--	--	0.3
4	1	--	--	--	--	--	--	--	--	--	--	--	--	0
9	1	--	--	--	--	--	--	--	--	--	--	--	--	0
		9%	33%	1%	1%	56%		--	--	--	--	--		$\bar{x}$=0.5
Oxbow Reservoir														
2	61	--	40	--	--	--	--	--	--	--	--	--	--	0.7
3	163	--	75	--	--	--	--	--	--	--	--	--	--	0.5
4	66	--	1	--	--	--	--	4	--	--	--	--	--	0.1
6	43.5	--	--	--	8	--	--	7	1	41	1	--	--	1.3
9	4.5	--	1	--	--	--	1	--	--	--	--	--	--	0.4
11	2	--	2	--	--	--	--	--	--	--	--	--	--	1.0
			65%	--	4%	--	1%	6%	1%	23%	1%	--	--	$\bar{x}$=0.7
Brownlee Reservoir														
2	71	--	21	--	--	--	--	--	--	--	--	--	--	0.3
3	27	--	7	--	--	--	--	--	--	--	--	--	--	0.3
9	22.5	--	--	--	3	--	--	--	16	--	2	6	1	1.2
			50%	--	5%	--	--	--	29%	--	4%	11%	2%	$\bar{x}$=0.6

Appendix 2. Continued

Table 1.

Weiser River System

Month	Hours fished	RBT	BRK	LMB	CUTT	WRB	Fish/ hour
Middle Fork Weiser River							
3	2	2	1	--	--	--	1.5
C. Ben Ross Reservoir							
3	5	--	--	1	--	--	0.2
Lost Valley Reservoir							
5	1031.5	370	4	--	4	--	0.4
6	46	18	--	--	--	--	0.4
10	18	19	--	--	--	--	1.1
		98%	1%		1%		$\bar{x}$=0.6
Lost Creek							
6	4	3	--	--	--	--	0.8
West Fork Weiser River							
9	3	10	--	--	--	2	4.0
Hornet Creek Reservoir							
10	0.5	6	--	--	--	--	12.0

Appendix 2. Continued

Table 1.

South Fork Salmon River (SFSR) System

Month	Hours fished	HRB	BULL	WRB	WF	CUTT	Fish/ hour
South Fork Salmon River							
6	2	--	--	--	--	--	--
10	3	1	1	--	--	--	0.7
East Fork SFSR							
7	78.5	9	3	50	6	1	0.9
Lick Creek							
7	4	--	--	10	--	--	2.5
Secesh River							
7	1	--	--	2	--	--	2.0
							$\bar{x}$=1.5

Table 1.

High Lakes and Reservoirs

Month	Hours fished	HRB	BRK	Fish/ hour
Brundage Reservoir				
8	4	--	--	0
Goose Lake				
8	28	4	2	0.2
Hazard Lake				
8	6	--	9	1.5
Scribner Lake				
8	2	--	4	2.0
Rainbow Lake				
7	3	2	--	0.7
Rice Lake				
8	15	--	--	0
Long Lake				
8	8	1	--	0.1
				$\bar{x}$=0.6

Appendix 2. Continued

HRB	=	Hatchery rainbow trout
WRB	=	Wild rainbow trout
RBT	=	Rainbow trout (unspecified origin)
CUTT	=	Cutthroat trout
BRK	=	Brook trout
BULL	=	Bull trout
SH	=	Steelhead
CO	=	Coho salmon
CH	=	Chinook salmon
KO	=	Kokanee salmon
WF	=	Mountain whitefish
YP	=	Yellow perch
CC	=	Channel catfish
BB	=	Brown bullhead
SMB	=	Smallmouth bass
LMB	=	Largemouth bass
BC	=	Black crappie
BG	=	Bluegill
CARP	=	Common carp
SUCK	=	Large scale sucker

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